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A YEAR ago or more we invited our readers to submit their votes for the best ten specimens of American architecture, hoping that the result would be both amusing and instructive, and we feel that it was fairly so. We now wish to make a similar suggestion, and, as the result may easily be of the greatest practical value, we hope for a much more generous response. It must have been noticed how frequently appeal is made to us to furnish the names of books in the several branches of architectural literature, and it must be patent that our answers must be based almost wholly on our personal familiarity with architectural books, which, like that of any other member of the profession, is limited and imperfect. As a means of providing ourselves and our readers with a ready reference-list of valuable books, we have perceived that no method promised so good results as that which the coöperation of our readers could produce, and we therefore ask our readers to send to us lists of the twenty books that experience has shown them an architect can least easily afford to be without. As no two men are likely to think alike, we imagine that an examination of the ballot will disclose the titles of some three or four hundred books which can be classified before publication, under such headings as: general treatises, dictionaries, histories, separate styles, drawing, general construction, strains, materials, carpentry, ironwork, cements, roofs, plumbing, painting, law, heating, ventilation, sanitation, water-supply, and treatises on separate classes of buildings, and so on. We seem to have here enumerated about twenty classes quite accidentally, and not with the intention that each voter should name a book under each of these heads: on the contrary, it would be preferable that any one who has made a special study of any branch should compile his list mainly from the books that bear on his specialty. We do not mean, moreover, to limit the list to twenty numbers only. The list should be written on one side of the paper only, and should state: (1) the selling title of the book, (2) the author's name, (3) the name and address of the publisher, (4) the date of publication, (5) if illustrated, whether by plates or cuts in the text, (6) the actual or approximate price. If the voter chooses to express a brief opinion of the value of the work, so much the better. As this compilation, if successful, will have a practical value to every one, which cannot be said of the lists of favorite poets, novelists, or historians, or the lists of select reading for the young, which have now and then been published in other journals, we hope that our readers will give to its preparation the time and thought it demands.

THE twentieth convention of the National Board of Fire Underwriters, held a few weeks since in New York, was unquestionably an important meeting, and the address of Mr. D. A. Heald, Vice-President of the Home Insurance Company, a very able and exhaustive exhibition of the present status of the insurance interests of the country; but though it bristles with facts, figures and tables, it would take the instinct of an actuary to get from them, without the closest study, the meat which they contain. The discussions were more of private than public interest, as the feeling seemed to be that it had become a matter of vital interest to examine the present methods of insurance, to discover whether it were possible for any companies to survive under the now common practices, high commissions, cut rates and extravagant expenditure. The important point of the meeting was the adoption of a fixed scale of commissions for agents and brokers, lower by some points, we believe, than the average of recent years. The interest that underwriters have in the constructive methods employed by architects and builders seems to have been wholly neglected, and the only thing we notice bearing on the matter in Mr. Heald's address is the remark, apropos of the ratio of burning, that "rates have little, if any, influence on the ratio of burning." As a statement of past facts, this may be accepted as true, but as to potential facts, we believe it very wide of the mark. We have so often expressed our belief that the underwriters had it entirely in their own hands to materially reduce the annual fire-loss, that it is needless to go over the ground again. We trust, however, that before long they will find a way of employing their organized efforts in encouraging better building. If the companies forming the National Board will really work together, and stick to the letter of their compacts, as they now seem disposed to do, we believe they could safely venture on so drastic a measure as to decline absolutely to write risks on new buildings, begun after the adoption of the measure, which did not fulfil certain minimum conditions of safe building, and the grade and character of the requirements could be raised from time to time, the movement being encouraged by a further discrimination in rates. It seems to us that an organized capital of seventy-eight and a half million dollars, which now pays nine and one-half per cent to the stockholders who own it, may safely undertake such a step as this, and that the stockholders would be willing to sacrifice five or ten per cent of their dividends for the sake of having a more reasonable assurance that the remainder could be safely counted upon as a regular and permanent income.

ON the whole we are glad we do not live in New York, life is getting too complicated and upheavals, physical, social and political are more frequent than our Puritan blood could endure. The physical disturbances are those which most often interest us, and we trust our readers will bear with us while we recount how once more the streets of the metropolis are found to contain buried millions for which like true miners the operators have to drift and tunnel till they strike the "pocket" where the metal lies, deep in the trousers' leg of each tax-payer. The newest corporation which has secured for itself the right to inconvenience its fellow citizens for its own certain and their possible benefit by tearing up the road-beds is the Standard Gas-light Company, which proposes to furnish the city and its citizens with illimitable cheap water-gas. Apart from the fact that water-gas is generally supposed to be only less dangerous than the natural-gas which is now used with more or less safety in some parts of the Middle States, and hence that the new enterprise will introduce an added zest to daily or nightly life, the scheme of operations of the new company is interesting and highly commendable in that it first sets the example of coöperating with another occupant of the sub-pavement region in such a way that the public will be annoyed by the execution of one compound in place of two individual operations. The gas company has affiliated itself in a certain degree with the New York Steam Company, and for laying its pipes will make use of the same trench which the steam company is obliged to dig, the steam-pipes being laid six feet below grade, while the gas-pipes can be placed only three feet from the surface; so that whenever the steam company extends its lines, the gas company will probably extend in the same direction, and thus will be less of a nuisance to the public than other enjoyers of similar privileges. In a still more ingenious way the gas company will take an economical advantage of the existence of the steam company and its plant. In the manufacture of water-gas the hydrogen needed, to the amount of seventy per cent of the entire mixture, is obtained from steam, and perceiving that at

night when factories and private houses have no or small use for the steam which the steam company can, and to a certain extent does supply, since the pressure in the steam mains has to be kept up, the gas company proposes to manufacture its gas at night when the steam plant would otherwise be idle. In this way the steam company becomes interested in the success of the new enterprise, as it is thus assured of an income for the hours when its plant is now idle. The two companies therefore seem likely to work most harmoniously together, and have already bought, at an outlay of a million-and-a-half dollars, six sites at intervals of a mile on the river front, where will be erected steam-generating and gas-manufacturing plants, gasometers and so on. Realizing that in water-gas it has a subtle substance of somewhat undefined characteristics to deal with, the Standard Gas-light Company proposes to use wrought-iron pipes for distribution such as are now successfully employed for natural-gas, and contracts for two hundred and fifty miles of these pipes are, it is said, soon to be placed.

AN international exhibition of a restricted but not the less interesting character will be held in the Kunstlerhaus, at Vienna, during December and January next, under the auspices of La Société des Arts Graphiques. The objects admissable for exhibition are such engravings, etchings, woodcuts, lithographs and any form of illustration produced by any of the innumerable chemical processes as have been produced in any part of the world since the exhibition of 1883. Illustrated publications will also be admitted, and though not so stated we presume that the processes of chemical reproduction will be shown in operation, as well as the perfected results. Contributions from all quarters are solicited, and must be sent before the end of September to the bureau of the Society, VI, Magdalenstrasse, 26. Contributors are requested to forward their plates unmounted, the Society charging itself with the cost of framing and hanging. The jury of admission will consist of three members of the Society and four members of the Kunstlergenossenschaft, or Society of Artists, who will also award the medals and honorable mentions. The Society reserves the privilege of publishing in its annual, the *Jahrbuch der graphischen Künste*, which will serve also as the catalogue of the exhibition, such plates or portions of plates as may seem advisable, the method of reproduction being arranged with the author of the plate. Further publication will also be made, together with critical reviews of the exhibits, in *Die graphischen Künste*, the organ of the Society. This is, we believe, the first of a series of annual exhibitions of this kind which are to be held at the same place about Christmas time each year.

TURNING over some old papers the other day, we came upon two or three bills for carpenter-work and plastering, dating back to 1821 and 1822, which have a certain interest, as showing the value of work and materials at that time, compared with the prices now current. One thing which surprised us, and will, perhaps, be equally surprising to our readers, is that the cost of lumber, keeping in view the comparative purchasing power of money, was at that time far greater than it is now. Sixty-five years ago a large part of the United States, which is now cleared, was an unbroken forest, and every township in the Eastern States must have contained a good deal of timber of the original growth, yet we find "refuse boards" charged in 1821 at eleven dollars a thousand feet, which would be a high price now, while painters' work, which is the only labor we find charged in the bills just now before us, is put down on the bill, which would naturally include profit, at seven shillings and sixpence, or one dollar and a quarter per day. The inference is that it would have taken a painter or carpenter in those good old days at least twice as long to earn money enough to pay for boards to cover his house as it does now, notwithstanding the fact that the timber is brought ten times farther to market now than it was then, and that the supply is, according to all accounts, nearly exhausted. Among the other items we find laths charged at seven shillings, or a dollar and seventeen cents per thousand, and clapboards at "twenty-five cents for ten," or twenty-five dollars per thousand. This would be a low price for pine clapboards now in Massachusetts, but it was a high price then compared with the value of labor. Contrary to the general impression, spruce and hemlock seem to have been very generally used, and we find items of hemlock boards at eleven dollars a thousand feet, and spruce at fourteen or fifteen. Clear pine plank, which many people imagine to be a much scarcer material now than in the days when second-growth timber was unknown, is charged in the bills at fifty dollars a thousand feet, which would be a tolerably high price in the same locality to-day, and corresponded then to about twice the value, in the form of labor and cost of living, that it could be exchanged for now. Of some materials, the cost seems to have been even greater then than at the present. In a bill for painters' work, dated 1827, we find oil charged at twenty-three cents a quart, which even allowing for profit, is a higher price than most architects would now approve in a days'-work bill, and varnish is put down at the rate of four dollars a gallon, a charge which would just about pass an architect's criticism in these days. One of the items is for "green paint for chairs," so that if any of our readers are of an archæological turn of mind, they may make a note here that the fashion of covering furniture with this ugly and adhesive coating, which has not died out even in our own college days, dates back at least fifty-nine years. The credits on this bill, which amount to about seventy dollars, include items of thirty-five bushels of potatoes at thirty cents a bushel, and two barrels of cider, differing apparently either in size or quality, as one is credited at two dollars, and the other at eight shillings, Massachusetts currency, or one dollar and thirty-three cents.

ALTHOUGH the responsibility of building contractors with us is not so great or so rigidly defined as it is in France, it seems possible that a claim might be brought against an employer who had detailed a workman to do a certain job under the direction of the owner, who might afterward seek to recover damages on the failure of the work, although the contractor had never visited the job, and had given no advice or order relating to it. A French gentleman wrote to a contractor to send him a workman to build a hot-house, the workman to do the work as the owner should direct. The contractor provided the workman, and also a certain quantity of cement which was used in building the walls of the hot-house, the owner supplying the other materials. As these walls, built under the owner's orders, were too thin, they fell down before the building was completed, and had to be rebuilt more stoutly. After a while, the contractor sent in his bill for the wages of the workman and the quantity of cement supplied. The owner offered to divide with the contractor the cost of the rebuilding made necessary by the accident. The contractor declined this offer and brought suit for the full amount, but lost it and was condemned, moreover, to recompense the owner for the damage the accident inflicted on his plants. In spite of this, *La Semaine des Constructeurs* holds that the contractor's responsibility exists only when he has the right to give orders to his workman, and actually watches or has the right to watch over the manner in which the work is done. It seems to us, however, that if the workman was really in the employ of the owner, the contractor made a mistake in sending in his bill for anything more than the cement he supplied for the job. If contractors are to be held accountable in such cases, it seems that the only way they can relieve themselves from risk is to remove the detailed workman from their pay-rolls during the job and re-engage him on its expiration.

A NEW method of protecting iron with magnetic oxide, the invention of M. de Meriteus, is briefly described in *Engineering*, which expresses the opinion that if the method works as successfully in practice as it does in the laboratory it will probably supersede the Bower-Barff process, as it is so much simpler in manipulation. In a bath of distilled water heated to 156° to 176° Fahrenheit, the metal to be coated is placed, and an electric current passed through it, the current having only sufficient electro-motive force to decompose the water. The oxygen when liberated collects on the metal, and in a few minutes the darkening of the surface shows that the union of the gas and metal has taken place, and that magnetic oxide, Fe^3O^4, has been formed; in an hour or two the coating of magnetic oxide will resist a scratch brush and will take a fine polish. Apparently the only thing to avoid is the use of a too strong current, the effect of which is to cause the formation on the metal of a pulverulent oxide which has no resisting power. It seems that with a tank of distilled water, a small dynamo, care and a little experience, metal work may by this process be protected by the ordinary contractor, and practically almost *in situ*.

STUDIES IN THE RENAISSANCE.[1] — IV.

THE ARABESQUE.

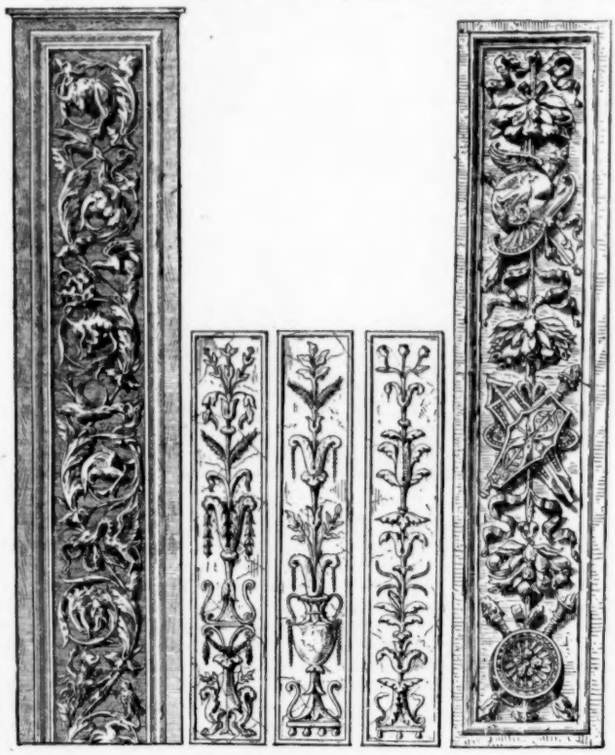
Fig. 8.

IN a former number we discussed the origin and beauties of the "arabesque," and we promised to return to that interesting element of the Renaissance before passing on to other details. Thus far we have traced this beautiful form of decoration back to the polychromatic ornament of the Greek *antæ*, and have seen how the Romans filled in the panels of their *antæ* with acanthus scroll-work. It seems clear that the *cinque-cento* ornamentists could not claim to have originated the arabesque, although, as we shall presently find, they may take credit for clothing it with a thousand-and-one fresh and beautiful forms.

Reference has already been made to the unfortunate nomenclature of the arabesque. It might, with much more propriety, have been called the "grotesque," if that word had retained its original meaning, for this class of ornament undoubtedly sprang from the ancient models found in the baths or grottos of old Rome. The word "grotesque" has long stood for something more coarse than the graceful and delicate, although fanciful, conceptions which are called arabesques. Some authorities have wisely suggested that the term "Raphaelesque" should be applied to this class of ornament; for, no doubt, the growth of it is largely due to Raphael's renowned Vatican designs. The name has not, however, been received with favor, and the misnomer "arabesque" must still hold good. Before studying it in the charm of its full *cinque-cento* bloom, we may profitably look at its development in the *tre-cento* and *quattro-cento* periods, for it must not be supposed that the beautiful conceptions of the sixteenth century sprang into life in a generation. The way was paved for that wonderful epoch by the men of centuries before. So soon as the early part of the thirteenth century, Nicolo Pisano, an enthusiastic and able reviver of antique sculpture, made a stand for a return to the style of the Classics. Other great men — who are now remembered only, or principally, as *literati* — spent years of labor in the same cause. Those sworn friends, Petrarch and Boccacio, really spent more time in the preservation and restoration of old Roman and Grecian literature than they did in writing the prose and poetry which has made them famous. Cosmo, the father of the Medici, was surrounded by a noble band of learned men, who labored hard for a revival of Classical learning, and but for their pioneering efforts in this direction, it is hardly likely that a revival of the Classic in architecture and ornament would have followed. The establishment of the printing-press and the wondrous wood-cuts which, ere long, made their appearance in the earlier books, did much to help forward the revival, especially the development of the arabesque. Andrea Mantegna's illustrations to "*Hypnerotomachia, or the Dream of Poliphilus*," published about 1490, afford a noble example of how the printers first commenced to distribute ornaments which were founded upon old Greek and Roman forms.

The publication of the works of Vitruvius, about the same time, gave a great impetus to art in a like direction; but generations before this there is evidence that the Italians never took kindly to the prevailing Gothic forms. In the ceilings of the Church of Assisi, ascribed to "the father of painting," Cimabue, we find the acanthus beautifully drawn, a fact which shows that the loveliest of decorative conceptions renewed vitality at that early date. This was, however, but the budding of the new style; the blossom did not appear until the beginning of the fifteenth century. Prior to this it was more a revival of principles; presently it became a literal renaissance, and carried all before it. In considering the works which are associated with this transition period, one cannot help admiring the freshness of those early efforts which show a desire to return to the æsthetic principle. Indeed, it is questionable whether the combinations of Classic with the prevailing Christian elements, which we find in the beginnings of the epoch, are not less stilted and more admirable than the later very correct but painfully academical copies of the antique. The pioneers worked with a *chic* and *naïveté* that were, to a great extent, curtailed a few centuries later. In the Renaissance, particularly in the arabesque, recourse was had to all sorts of fruit and flowers, and it is interesting to note the earliest example of this adoption of purely natural forms, simply *for the sake of their beauty* and apart from symbolism. It is to be found in the Cathedral at Lucca, in the celebrated monument to Ilaria di Caretto, erected in 1413 by Jacopo della Quercia. A good cast of this remarkable work may be seen at the Crystal Palace, and those of our students who are within reach of the excellent Renaissance court which is to be seen there, will do well to visit it. The chubby boys, or *puttini*, supporting festoons of flowers, were, at the date of their production, a startling innovation on current traditions. The fountain in the Market Square, Siena, by the same sculptor, was another step in the Renaissance direction, and secured for Jacopo the sobriquet of "Jacopo della Forte." But, tempting as the general history of this period always is, we must direct our attention to the growth of the particular piece of ornament — the arabesque —which is now under consideration, and we find a suggestive lesson in its development on the renowned bronze gates of the Baptistery at Florence.

The fifteenth century had no sooner dawned than the art circles of Florence decided to raise another gate to the Baptistery, as a companion to the one by Andrea Pisano, which was designed under Gothic influences. We need not here recount, at length, the story how the artists of Italy entered into the competition, and that three, Brunelleschi, Donatello and Lorenzo Ghiberti, were credited as being "worthy." Somehow or another, the two former retired from the competition—it is said, voluntarily—and young Ghiberti, then only twenty-two years of age, set about his gates. It took twenty-three years of honest labor before Lorenzo had the joy of seeing the first part of his task finished, but when it was erected it took every one in grand old Florence by storm, and the authorities, as evidence of their satisfaction, gave Ghiberti an order for another gate, a work which he finished about the year 1444. It would be difficult to overpraise the beauty of this supreme effort of the early Renaissance, or the effect which it had upon the propagation of the new style. Fortunately, most of our museums now possess replicas of Ghiberti's work, and it is delightful to study such excellent casts; but to see the gates themselves is a rare and impressive pleasure—at least we found it so when making our notes from the originals in Florence. They have so often been copied and illustrated in various books, that we need not give fresh engravings of them here. We have, moreover, only to deal with one portion of them just now; viz., that which concerns the history of the arabesque—and it is the band of ornament surrounding the panels, rather than the Scriptural subjects of the panels themselves, that is calculated to serve our present purpose. The piece of the banding which is shown in our initial cut will sufficiently indicate the character of all the rest. Therein, Ghiberti has tied together, with consummate skill, a collection of leaves, flowers, fruit, vegetables and birds, cut in alto-relievo, of which the section here illustrated gives a fair sample. When it is remembered how early in the history of the Renaissance — before the second half of the fifteenth century—this effort was put forth, the talent and courage of the young sculptor become amazing. No wonder that such artlights as Buonarotti and Raphael revered the name and works of their gifted predecessor, Ghiberti. Anon, we shall have to talk of some contemporaries of Ghiberti — notably, Lucca della Robbia and Filippo Brunelleschi — but for the present it is enough to show the



Figs. 9, 10, 11, 12 and 13.

[1] Continued from Vol. XIX., No. 538, page 154.

Fig. 14.

first blossoming of the arabesque in a naturalistic direction. While nature is, perhaps, too faithfully copied in these forms, there is an arrangement and banding together of the parts that makes the bordering truly decorative. We may here—just by way of showing that one, at least, of the contemporaries of Ghiberti used fruit and flowers in much the same way as he — draw attention to a beautiful medallion by Lucca della Robbia, which we saw in Florence. It is but inadequately illustrated in Figure 15, but a glance at the banding will show that the treatment of the fruit is much like that which is found on the Baptistery gates. Here, again, the forms are merely employed, together with the Classic dentil, on account of their beautiful line and shadow-giving properties. This bit of Robbia is, however, only introduced by the way. His work is a study by itself, and must be considered as such. The marked difference between this *quattro-cento* treatment and that which preceded it, was that nature not only supplied mere suggestions, but was drawn upon for exact models of anything and everything that had decorative properties about them. The typical element was eliminated, except in some general way—such as *puttini* and flowers to a fountain — and the purely decorative substituted. In designing, the artists disposed their

Fig. 15.

materials simply with a view to the picturesque and ornamental. Here, then, we get the first indications of a definite return to an æsthetic *motif*. Ghiberti employed these flowers and fruit because they made a beautiful border to his gates, full of light and shade, not desiring to convey any other lesson by their use than that of simple beauty. By this innovation the traditions of, say, a thousand years were broken, and art was liberated from the trammels of mystic symbolism. From this time *meaning* ornament practically succumbed in Italy, and has never to this day recovered its once proud position. We have dwelt rather long upon this stage in the development of the arabesque, for, while the origin of it in the Classic has been carefully shown, the branching out of its details in this new direction must be none the less carefully observed. Noting even this fragment, we can see how the door was opened for the admission of all sorts of comparatively new elements; and we should gather from this the useful lesson that any designer, in any age, can re-dress the Renaissance with such forms as are near him, without transgressing the canons of the *quattro-cento*, if not of the *cinque-cento*. How various Italian artists have, from time to time, clothed afresh the arabesque, will be made clearer by observing the rest of the annexed illustrations. Before considering them *seriatim*, we may remark that cartouches or scrolled shield-work figure largely in that Italian Renaissance which preceded the purified *cinque-cento*. Of those forms we must, however, speak later on. The *quattro-cento* was also distinguished for the first introduction of that remarkable style of arabesque — all too-florid — which culminated in Raphael's celebrated decorations in the *loggie* of the Vatican.

If asked for a definition of the elements which were used in designing at this pre-*cinque-cento* period, we should describe them thus: Classical ornaments used with conventional and natural flowers and foliage—the former oft-times bearing a strong resemblance to the Saracenic; men, women and animals, natural and grotesque; cartouches or pierced and scrolled shields in great prominence; tracery, independent and developed from the scrolls of the cartouches; and all sorts of jewel forms. Description is, however, of but little use to make clear the unparallelled variety of the elements of this richly-dressed style. These engravings will help our definitions considerably. Figures 14 and 16 have been sketched from a couple of beautiful Italian pilasters which are now in South Kensington. Figure 14 is from an Italian fountain, in Florentine blackstone (*pietra serena*) which formerly stood in a house at Florence. It is attributed to Benedetto de Mariano, date about 1490, and is a beautiful example showing how the arabesque was progressing at that period. Its details do not, however, depart largely from the Classic. Birds, masks, and a few shells, together with acanthus scroll-work, are the only elements in its composition. In the accompanying pilaster, Figure 16, greater freedom is shown, and it is on that account a more characteristic example. Towards the lower portion, musical instruments and even gardening implements, are strung with admirable skill from the central stem. The Classic element is strongly marked in both these designs, and the three simple pilasters, Figures 10, 11 and 12, are examples of the same class. We must dive farther into the history of the arabesque, in order to discover greater freedom, and Figures 9 and 13 herewith

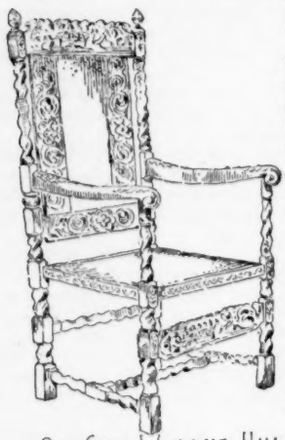
Fig. 16.

show two entirely different forms. In Figure 9 we get nothing but scroll-work running off into all sorts of queer birds and chimerical creatures, a design full of rare spirit and skill. No purely Classic pilaster ever contained half the wriggling, racy spirit which can be discovered in this fragment. In Figure 13, the panoply of a Roman warrior is separated, and, together with a few bunches of fruit, is made up into a charming arabesque. While the elements of this forcible design are purely Classic, the clever arrangement comes of the Renaissance, and, taken altogether, it shows that nothing which has graceful shape need be placed outside the scope of this most comprehensive of styles. In this case, moreover, all the details are strung from the top of the panel instead of springing from a stem, as is usually the case. There is no reason why the uniform of an ordinary nineteenth-century policeman or soldier should not be similarly hung up on a nail in a modern panel.

J. WILLIAMS BENN.

AN EDITOR'S TRIP ABROAD.[1]—VIII.

THE ARLBERG TUNNEL.—INNSBRUCK.—MAXIMILIAN'S TOMB.



OLD CHAIR. WOODSOME HALL. YORKS. ENG.
AFTER SKETCH BY WHITLEY
A.A. SKETCH BOOK. LONDON.

THOSE persons who dislike diligence riding, or who, for any reason, wish to take the most interesting railway route possible into or out of Switzerland, should certainly try the Arlberg line, either to or from Innsbrück, through the new tunnel. The train leaves Zurich, the prettiest and pleasantest city in Switzerland, at the very comfortable hour of five minutes before ten, and runs straight up beside the lake toward the Alps, which form the background of the Zurich landscape. The track runs almost in the water of the lake, and the passengers have just about time enough to become thoroughly penetrated with the beauty of the lovely country along both shores before they are suddenly transported into a gorge hemmed-in by tremendous precipices, which conduct them, past a long succession of snowy peaks, and ravines filled with ice, to the meadows of the Upper Rhine valley, the line of division between Switzerland and the Tyrol. After following the Rhine northward for fifteen or twenty miles, the train turns eastward, and plunges into the Tyrolese Alps, working its way upward along the side of the mountains which shut-in the narrow valley of the Ill, until it reaches the great tunnel, which, although not so long as the St. Gothard tunnel, is much higher above the sea. Of the supplementary tunnelling which often forms the prelude to a great work of the kind, there is at the Arlberg very little, so that the view of the approaches from the train is almost uninterrupted. On the east side, particularly, after the cars issue from their sixteen minutes of transit through the earth, into the wild valley through which they descend toward the Danube, the road is entirely open, with the exception of two or three very short tunnels, apparently built up purposely, in order to conduct the avalanches from the upper portions of the mountains safely over the track into the abyss below. A hundred miles more of this sort of engineering brings the train to Innsbrück, after travelling for nine hours, at express speed, constantly in sight of snow-mountains and glaciers; and the tourist has then the choice of proceeding either eastward to Vienna, northward to Munich, or south to Verona, as best suits his plans, or he may, as we did, stay over a day or two for the sake of taking a better look at the little Tyrolese metropolis.

A more unexpected sort of place the average tourist seldom comes across. One gets accustomed, when travelling in Switzerland, to frequent changes in the style and construction of the houses, which differ, almost in every valley, in some way from those in the neighboring valleys, but in Innsbrück all trace of ordinary Swiss or Tyrolese architecture disappears, and we find a sort of small Milan or Genoa, with additions from Munich and Nuremburg, dropped in the middle of an Alpine valley. Surprising as it was to find the stucco classicisms of Italy in the midst of the almost purely wooden constructions of the mountain villages, it seemed to me that much of the Innsbrück work surpassed, in perfection of execution, anything that I saw in Genoa. In the modern buildings, particularly, the cement surface was treated with an ingenuity which gave it a real artistic interest. Most of them, like the palaces which served as their prototypes, had rusticated basements, with two or three stories above, united by pilasters, and with windows dressed, and heavy cornices, with or without an attic above, and much pains seem to have been taken to give variety to the texture. A very successful device, which occurred repeatedly, was to cover the projecting faces of the basement rusticated with small stones, an inch or so in diameter, set by hand in the cement while soft. It might be imagined that care would be required to do this well, but the workmen seemed to have learned the secret, and the effect, in contrast with the smooth, monotonous mouldings and pilasters, was extremely good, independent of the piquant flavor which such an honest way of treating the material gave to the appearance of the building. For the other portions of the work it seemed to be thought sufficient to mix the stucco for the plain surfaces with coarse sand, using fine sand for the string-courses, pilasters and other dressings. Some of these were very elaborate; one house, in particular, apparently about two hundred years old, being covered with rococo decoration in cement, so heavy and so deeply undercut, that I could not for some time convince myself that it was not of solid stone. On trying some of the old stucco, I found it very hard and tough, resembling good limestone much more than the sandy, dispirited sort of material which our uncles and aunts used to daub over the outside of their New York and New England houses; and, without being entirely converted to plastered architecture, I am inclined to think that if the work could be done as well with us as it is in Italy and Germany, we should find it a valuable resource in the development of that more solid style of building for which there is certainly now a widespread demand in America.

At Chamonix, where a simple style of stuccoed construction is used for the large hotels, I happened to meet with the architect of one in process of erection, and obtained from him some information which supplemented very well that which I was trying to get from observation of the work going on. The walls of the new hotel, like most of those intended for stucco in all countries, were built of rubble, which in this case was of slate, although limestone is naturally the ordinary material. The stones were small; few of them, with the exception of the granite quoins and window dressings, being a foot long, and the wall, although as well bonded as was possible with such materials, looked to me as if it needed very good mortar to keep it in proper shape. The mortar was, however, very good; quite equal, I thought, to mortar of the same age made with one cask of the best Rosendale cement to two parts lime. It was, in fact, made with hydraulic lime, from some quarry in the neighborhood as I learned, mixed with about its own bulk of paste of fat lime, which is at Chamonix the more expensive material. The hydraulic lime seemed to me to have very feeble qualities of any kind. It was delivered in bulk at the building, in rather small, white lumps, and stored under a shed, but before using was brought out, a barrel or two at once, placed in a pen in the open air, and sprinkled with water enough to wet it thoroughly. This caused it to slake slowly, without heating, into a powder, which was heaped up in a convenient place, ready to be mixed, as wanted, with the fat-lime paste already stored near by, and the proper quantity of sand. All the exterior joints of the wall were laid "slack," the mortar not being allowed to come within an inch or two of either face, in order to give a good key to the subsequent stucco. On my inquiry as to the precise method of completing the plastering, which seemed likely to adhere but feebly to the slate, the architect told me that after the roof was on the building, he should have some mortar mixed very thin, almost like whitewash, and should have the wall treated all over with this, following the thin wash later with one or two coats of the ordinary mortar. This, if done by experienced men and with good materials, would, he was sure, give a permanent coating, and the appearance of the houses in the neighborhood, which were free from scars or stains, certainly justified his confidence.

At Innsbrück, although the cement used in the stucco must be of the finest quality, the method of employing it seems to be the same, and although the climate must be very trying, the result is all that could be desired, so far as cheapness and durability are concerned.

Even in the way of real architectural sensations, Innsbrück has more to offer than I had expected. Coming to the place in a certain sense accidentally, through a change in our plans, I had made no study of the guide-books, supposing that nothing more would be necessary than a ramble through the streets to find out everything in the town that I cared for. In pursuing this programme on the first evening after our arrival, I came across a church door, and, naturally enough, opened it and entered. Although it was nearly dark, I could see that I was in a lofty building, with marble columns supporting the nave arcade, a stone pulpit with marble stairs built into one of the columns, and a stone rood-loft carried on arches spanning the nave and aisles, but I was hardly prepared to observe in addition two long rows of gigantic figures in strange costumes, standing under the nave arches, with their backs to the aisles. A closer examination, followed by a second visit the next morning, showed that the twenty-four giants were statues, some apparently in brass and others in bronze, raised on a continuous plinth, and representing various more or less historical personages, from King Arthur of England down to the Austrian emperors of the sixteenth century, all dressed in armor, or brocade or lace, according to sex and circumstances, after the fashions prevailing in the sixteenth or seventeenth century, and very effectively modelled and finished. In the centre of the nave stood the great tomb of Maximilian, the beautiful sculptures on which are, I suppose, pretty well known to most people, but the novelty of the huge brass figures in ruffles and lace, which stood near, made them more interesting to me than the tomb, or, indeed, than anything else in the church, except, perhaps, the superb wrought-iron work which surrounded the Maximilian monument, formed the chancel screen, and protected nearly all the casual openings about the building. Except the beautiful lock on the door, the ironwork was not extremely delicate, but it was coiled and twisted and interwoven with a variety of design, and a masterly handling of

[1] Continued from page 62, No. 554.

the material, which has certainly been seldom surpassed, and would be even more striking if it were not for the gilding with which here, as in most other places fortunate enough to possess such treasures, the best portions have been "touched up," to the ruin of their proper effect.

THE ILLUSTRATIONS

Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.]

GALLERY IN THE GOVERNOR'S WINTER PALACE, ALGIERS.

[Gelatine print issued only with the Imperial and Gelatine editions.]

COMPETITIVE DESIGN FOR A $5,000 HOUSE, SUBMITTED BY "*Adonis.*"

STONE to run across north and part of east side; to be a local sand-stone, rock-faced, left very rough and dressed to a line. Exterior stained. Interior (main rooms) chestnut-filled and stained to imitate oak. To be a small laundry and a servants' closet in basement. Servants' room and a large "play-room" finished off in attic.

MASONRY.	
Preliminary,	$27.00
Excavation,	118.08
Footings,	52.00
Foundations,	244.80
Underpinning,	460.40
Windows,	56.25
Hatchway or area,	9.60
Piers and partitions,	1.80
Chimneys, mantels and grates,	285.00
Lathing and plastering,	242.50
Cellar bottom,	59.00
Drains,	36.78
Cesspool,	28.25
Sodding and grading,	30.00
Total of Masonry,	$1,651.46

CARPENTRY.	
Frame,	$216.25
Frame covering,	284.62
Gable covering,	45.24
Roof	120.52
Cornice	42.47
Cellar hatchway,	18.00
Windows,	542.00
Dormer windows,	54.00
Veranda,	$25.00
Cellar windows,	13.75
Floors,	262.10
Closets and store-room,	7.75
Doors,	287.00
Stairs,	130.00
Wainscoting and base,	54.75
Pantry and butler's pantry,	34.00
Kitchen sink, etc.,	5.00
Tower,	85.75
Tank and wash-trays,	23.00
Bath-room,	12.00
Water-closet in basement,	10.00
Mantels,	151.00
Book-case,	15.00
Wash-stand,	3.00
Cold-air duct,	5.00
Coal-bins and partitions in cellar,	10.00
Miscellaneous,	33.00
Painting,	260.00
Tinning, slating, and galvanized-ironwork,	260.00
Plumbing and gas-fitting,	234.00
Total carpentry,	$3,184.20
Total masonry,	$1,651.46
Builder's profit, at 8%,	387.28
	$5,222.94

COMPETITIVE DESIGN FOR A $5,000 HOUSE, SUBMITTED BY "*Mark Twain.*"

MASONRY.	
Excavation,	$ 62.50
Foundations,	329.00
Chimneys, mantels and grates,	336.60
Lathing and plastering,	340.00
Drains,	63.00
Miscellaneous,	137.50
Total of masonry,	$1,268.60

CARPENTRY.	
Frame,	$288.00
Frame covering,	412.00
Roof,	199.00
Cornice,	143.00
Windows,	515.60
Dormer windows and gable windows,	75.00
Veranda,	284.60
Cellar windows,	15.00
Fan-lights and transoms,	16.45
Floors,	304.50
Closets and store-room,	19.10
Doors,	341.90
Stairs,	176.45
Wainscoting and base,	90.50
Pantry and butler's pantry,	36.75
Kitchen sink, etc.,	4 50
Bath-room,	22.50
Water-closet,	9.00
Mantels,	200.00
Book-cases,	20.00
Miscellaneous,	11.50
Painting,	205.00
Tinning, slating and galvanized-ironwork,	32.30
Plumbing and gas-fitting,	209.00
Total of carpentry,	$3.632.15
	1,268.60
	$4,900.75

COMPETITIVE DESIGN FOR A $5,000 HOUSE, SUBMITTED BY "*Peu-à-Peu.*"

COMPETITIVE DESIGN FOR PARK AVE. METHODIST EPISCOPAL CHURCH, PHILADELPHIA, PA. MR. BENJAMIN LINFOOT, ARCHITECT, PHILADELPHIA, PA.

NAVE OF S. MARIA MAGGIORE, ROME.

AMERICAN ARCHITECT COMPETITION FOR HOUSE COSTING $5,000.[1]—V.

"*MULTUM IN PARVO.*"—Novelist not isolated. Plan is simple. Nursery is well arranged. A small porch is not a loggia. Details are simple. Staircase balustrade is rather light. Three balusters to the tread would have better effect. Exterior is bare and uninviting. A square tower in stone is interesting, on account of the variety of surface and color in the stonework, and in the way stonework is laid, and also has dignity and mass, and the advantage of shadow in the deep window reveals; but in wood it is apt to be stiff and hard, and to dwarf the remainder of the house.

The house needs shadow, and also needs one belt-course carried around it. Should say that lowering height of stories, roofing house with one long roof with gable at each end; making tower more nearly octagonal, or else twelve-sided; carrying belt around at eaves lines, and making roof to front porch would make the house much better in design. Rendering rather crude.

"*Adonis.*"—Good first-floor plan except for rounded corner. Novelist isolated. Exterior: A chimney brought down over an archway is never agreeable in design. The north side might be made something of if it were not for the third-story excrescences; but the south is more hopeless. This design happens to be a good one to select to point a moral by. In any building that has a roof that is other than flat, the relative proportions of roof and wall are among the first things to be considered, and if the roof is to have any part in the general effect (as it certainly does in the set of designs sent in for the competition), the simpler it is the better. To make a roof simple, not only necessitates the use of a good liberal length of ridge, but also an equally generous length of the lines of eaves, "*Adonis*" has completely nullified the effect of what in construction is a simple roof by cutting the eaves into all sorts of long and short lengths of various levels. Interior details very good. Dining-room alcove good. Rendering clever throughout.

"*Peu-à-Peu.*"—Plan good. Details few but fairly good. Exterior simple. Has the usual defect of gambrelled houses with short ridges, it looks lumpy. View of it from north would not be good. A narrow strip of the lower pitch of a gambrel brought down and contrasted with straight wall is always unsatisfactory. The house would be much better if it could be made lower, and if the ridge could be lengthened. The curved buttresses at entrance steps are not good. Rendering weak and simple.

"*Nemo.*"—Study should not open from the parlor. Plan otherwise fairly good. Details: The end of the settle is not good. Porch cornice needs a frieze. House needs more eaves. General outlines and proportion simple and good. Rendering, lines are shaky, unskilful and uncertain. Foliage is very bad.

"*Utility.*"—Plan compact and fairly good. Novelist isolated in third story. Passages are narrow; night nursery small. Details fairly good. Design of exterior rather clumsy: with such an expanse of wall more projection of eaves is needed, to give horizontal shadows. Shingled arches are at best unattractive, and compose much better with a long, low house than with a square, high one. Dormer too small. Rendering of everything but perspective hasty, but with knowledge of perspective overworked. Stained-glass design is very bad.

"*Mark Twain.*"—Waste room in hall. Studio unnecessary. No constructive details. Interior details: staircase very bad; mantel clumsy. Exterior design, south side too much cut up. Northeast view good. Outlook too high and thin. Rendering a little labored, but fairly good, excepting landscape. The house cannot be built for the money.

THE LIFE AND WORK OF SIR CHRISTOPHER WREN.[2]—II.

I MUST not pass over Wren's work at Westminster, although it reflects no credit upon him. We can only say, in his defence, that he acted for the best, according to the light of his time, and carried out the instructions laid upon him. It is probable that Westminster Abbey did more for Wren than he for it, for the influence of his study of Gothic work necessitated by his careful surveys of this church and Salisbury Cathedral is evident in much of his subsequent work. With regard to the much, and justly, abused west towers, it is only fair to say that Wren had very little to do with them. He only built the lower portions of them, and they were carried on and finished by Mr. Hawksmoor and two other architects. Wren made a design for a central tower, with lantern and spire, which was fortunately never carried into execution. The survey of Salisbury Cathedral took place before the building of St. Paul's, and it probably influenced the St. Paul's work to some little extent, although Wren would probably not have admitted this himself. It is well known that in St. Paul's the proportion of solids to voids is far less than in other Classic churches of large size and importance, a recommendation which needs no comment.

The stonework of Salisbury Cathedral had not suffered nearly so much as that of Westminster Abbey, and so the church escaped Wren's hands with very little injury. Indeed, we have to thank Wren for what little he did do, for I doubt very much if the grand central spire would be remaining at this day if Wren had not made some important structural repairs to it. He found it leaning over considerably and very insecure, but he repaired it so well that it has not moved an inch since. Wren spoke in terms of quite respectful admiration of the character of the work at Salisbury.

One of the finest schemes Wren ever conceived, and one which unfortunately was never carried out, was his design for the rearrangement of London in rebuilding after the fire. I have made a rough sketch of the plan he proposed, and I think all will agree that a better arrangement for a business city could hardly be made. All the principal approaches to the town—mostly, I believe, the old

[1] Continued from page 62, No. 554.

[2] A paper read before the St. George's Art Society by Mr. Arthur Keen. Continued from page 53, No. 553.

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AMERICAN ARCHITECT COMPETITION · ADONIS · ....

First Floor Plan.

Second Floor Plan.

AMERICAN ARCHITECT COMPETITION ..... 1886. ADONIS ...

Front Elevation.

Dining Room Mantel.

Elevation of Staircase.... Details ½" = 1'-0"

N. End of Living Room.

Bed Room.

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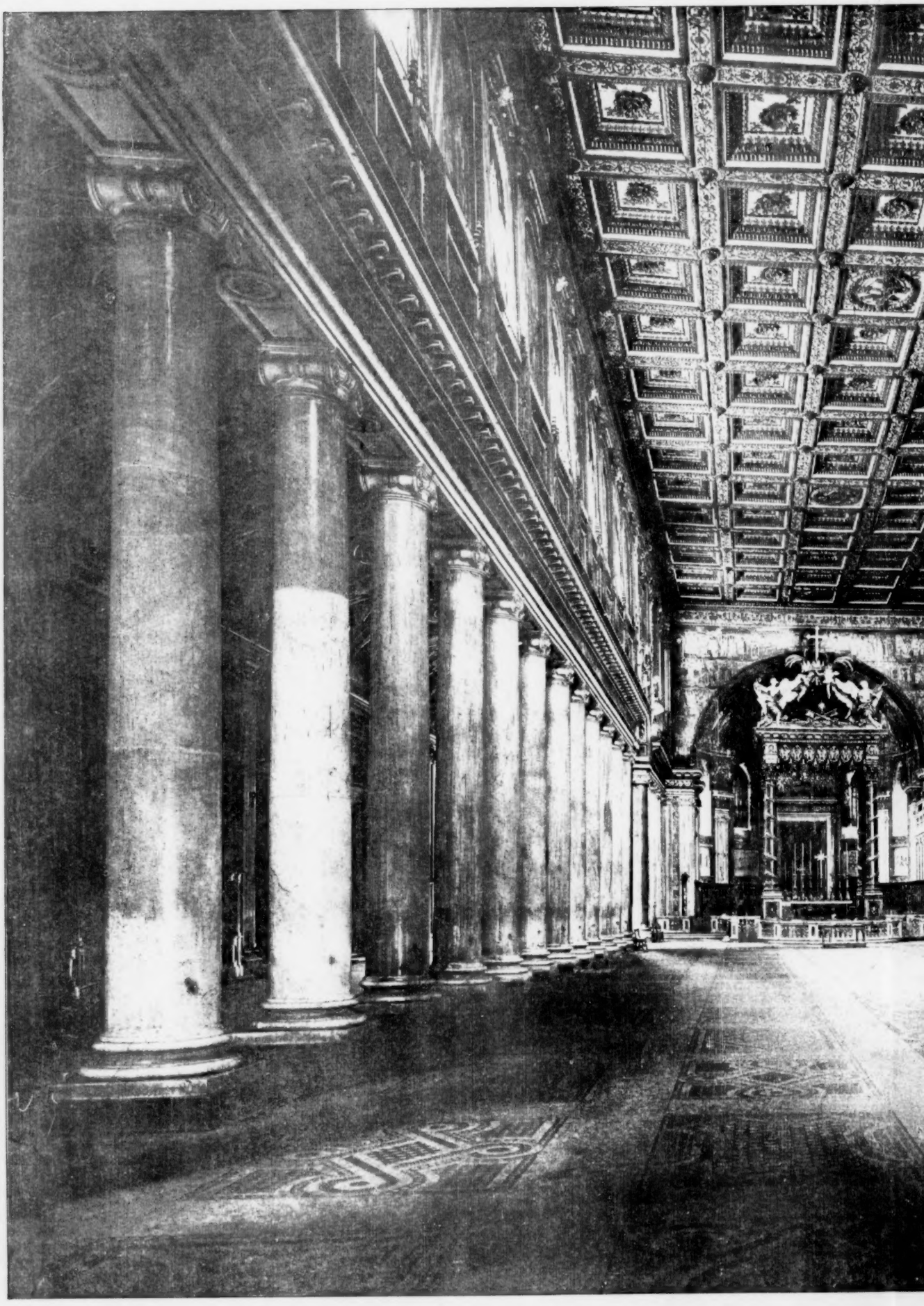

Santa Maria Mag

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AMERICAN ARCHITECT AND BUILDING NEWS, AUG. 14 1886. NO. 555

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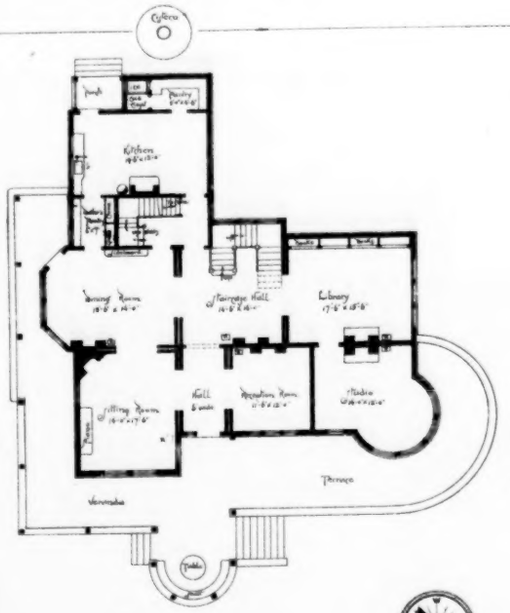


* First Floor Plan *

* Perspective View from the North East *

* Second Floor Plans *

— Scale for Plans and Elevations —

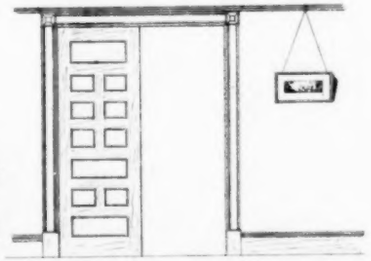
— Scale for Finish —

Americans Architect Competition
For A $5000.00 House — submitted by "Mark Twain" —

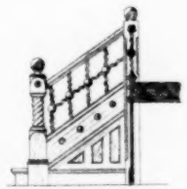
— View of South side Gable —

Wall sections

* South side Elevation *

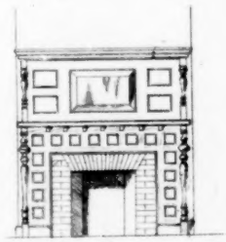


* Sliding Door & Finish *



* Stairs *

Sitting Room Mantel (see plans)



Drawing Room Mantel

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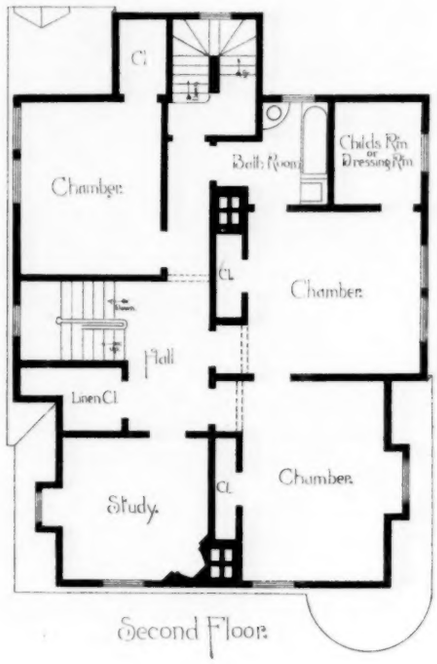
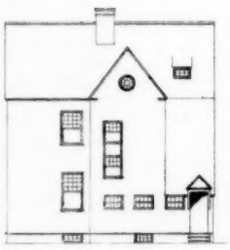
First Floor.

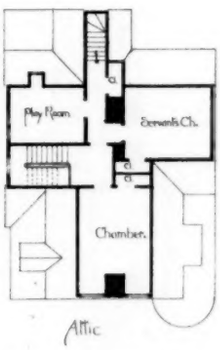


Second Floor.



Rear Elevation.

Section.



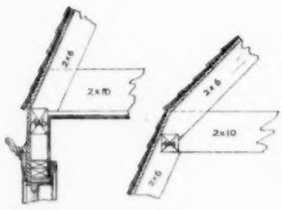
Attic.

Scale for First and Second Floors.
" " Rear Elevation Section and Attic
" " Details.

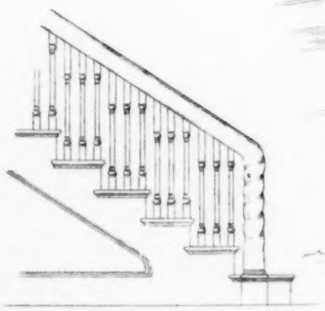
American Architect Competition.

$5000. House for a Novelist.

Peu-à-peu.
Feb 22d 1886.



Cornice.



Beginning of Stairs.

View from South.

Heliotype Printing Co. Boston.

Roman roads — are kept in their former positions, and good roads, ninety feet wide, are made from all the city gates. The Cathedral comes in a grand position at the junction of the two principal streets, and the Royal Exchange, with all the principal city offices and guilds grouped round it, stands in the centre of a noble piazza close to London Bridge, and forming a nucleus towards which most of the important streets converge. The churches, each with a good space in front of it, are arranged in the best possible position for sight and approach, while the great circles or piazzas in which the principal thoroughfares intersect give fine opportunities for architectural effect, besides assisting traffic in an admirable manner.

A wide wharf forms a worthy embankment for the river along the whole length of the city, approached at all points of importance by wide roads intersecting the city in all directions. The Fleet river — now unfortunately running underground as a huge sewer — was to be cleansed and widened so as to be available for shipping purposes, and spanned by bridges in several places. The principal streets were to be ninety feet wide, others sixty feet, and none less than thirty. All the principal buildings and markets were to have thoroughly good approaches, and it is a lasting pity that this scheme was never realized; for, besides the architectural dignity it would have fostered, it would have obviated in great measure the constant congestion of traffic which is the bane of modern policeman and man-of-business. The rights of ground owners and their eagerness to begin rebuilding without loss of time proved too strong for Parliament to cope with, and the city was rebuilt on the old lines and with the old narrow streets in most cases; even the most necessary feature, and one that Wren struggled hard for, the river quay, being sacrificed to the cupidity of unreasonable individuals. Wren succeeded in getting a Building Act passed in Parliament regulating the description of materials and such matters, but otherwise he was not able to control in any great measure the erection of private buildings in the new city. He acted as district-surveyor himself, and put down, with a high hand, any attempts at mean and unsanitary building.

In his general capacity as architect for the rebuilding of London, Wren directed nearly, if not quite, all the public buildings erected in the city until the time of his retirement. It is in these buildings — the churches and steeples chiefly — that Wren's wonderful originality of conception, and the versatility of his genius, are shown forth to the utmost; for he was, I believe I am right in saying, acting entirely without precedent in nearly all of them.

Of course, as has often been pointed out, these spires are built to some extent on the lines of the old Gothic ones; but really, in the case of most of them, beyond the fact that the towers have high tapering tops to them after the manner of the Gothic ones, the resemblance is not very apparent. Very few of Wren's spires are mere high-pitched roofs, like Gothic spires, but artfully-contrived and admirably-grouped stages, gradually receding so as to give the roof-like outline. In nearly all these — that is to say, the stone ones — Wren's favorite "cone" has been applied to carry the central mass of stonework from the walls of the tower, and Wren had ample opportunities for testing the qualities of this arrangement before applying it in the dome of St. Paul's. It is a noticeable feature in these steeples that they always start clear from the ground, instead of, as in many later works, off a pediment or roof, thereby losing partly the effect of the total actual height. The finest of these steeples is undoubtedly that of the church of St. Mary Arcubus, or le-Bow, begun in 1671 and finished five years later. The first church built on the site of the present one was a work of William the Conqueror's time. This church, being built on marshy ground was raised up on great arches well above the ground, a circumstance from which it took its name. The Court of Arches received its name in the same way, the meetings of this court being formerly held in the church.

Underneath the remains of this church, destroyed at the time of the fire, Wren found the walls and windows and pavement of a Roman temple which formerly stood there, and on these walls, as foundation, Wren built his church. The steeple, seeming to need better foundation than this, the excavation for it was carried farther down, and a Roman causeway, about four feet thick, formed of great stones firmly cemented, was discovered eighteen feet below the pavement. This causeway formed part of one of the principal streets of the Roman city, and was of so firm a character and in such good preservation that Wren adopted it at once as his foundation, and proceeded to rear the finest steeple he ever built, and I suppose the most beautiful Classic one in existence. The total height is two hundred and twenty-two feet, and the construction throughout is admirable and ingenious. It would take too long to go through the list of the spires of these city churches, and they are too well known to need much description. St. Bride's, Fleet Street, and St. Magnus the Martyr, at London Bridge, are two of the best of the stone ones. The former one is arranged after the fashion of a Chinese pagoda, with regularly diminishing stages, reaching to a total height of two hundred and thirty feet. This, again, is built upon the cone system. St. Magnus's spire, built 1705, is usually considered the second best of Wren's spires, but it is to my mind rather unpleasing in outline. These stone steeples of Wren's, though not in all cases as successful as might be wished, formed a starting from which later men developed such beautiful works as St. Clement Danes and St. Martin-in-the-Fields, steeples which seem to leave little more to be done for the attainment of perfection. The most picturesque of Wren's works are, of course, the lead spires and turrets which he has dotted here and there all over the city. Here, again, starting boldly on an entirely new departure, he has produced a series that would be a worthy result for a long course of development. They are of all possible kinds and shapes, from the formal and severe Gothic type, such as St. Swithin's, Cannon Street, or St. Margaret's, Rood Lane, to the quaintest and most fantastic compositions of arches and scrolls, pediments and obelisks, as at St. Faith's, Watling Street, or St. Edmund's, Lombard Street. A very favorite one is that on St. Martin's Church, Ludgate Hill, which forms, when seen with the dome of St. Paul's, a most beautiful composition, and one that cannot fail to strike even a casual beholder. To my mind, one of the very best of these lead turrets is that on the tower of St. Benet's, Paul's Wharf, a church built in 1683, of brick with stone dressings. Both the church and tower are very unlike Wren's usual work, and so successful in color and composition and so picturesque that it is always a wonder to me he did not do more work of a similar character. St. Peter's, Cornhill, is another church with a brick tower and a lead turret, very well proportioned, and of decidedly good outline.

There are many of Wren's towers finished as towers only, without turrets or visible roofs of any sort, but they are not among his most successful works. I fancy that many of them were intended to have lead turrets, which were omitted through lack of funds. One of these—St. Mildred's, in the Poultry—was pulled down in 1872 for street improvement, and was about to be ground up for Portland cement, but a kind-hearted man named Fytche bought it to save it from this degradation, and in hope of being able to rebuild it. The stonework is at present lying in a field on the east coast of Lincolnshire.

Wren's Gothic towers, with the exception of the one belonging to Christ Church, Oxford, come under this category, all being finished with angle turrets, as, for instance, St. Michael's, Cornhill.

A very interesting church, particularly so far as the interior is concerned, is that of St. James, Piccadilly. The nave has a barrel-vault in plaster, forty feet in span, with tranverse vaults at right angles with it over the aisles. The roof is a fine piece of construction. The whole span of sixty-eight feet is taken by one pair of rafters, and the necessity for a cross-tie is obviated by framing the ends of these rafters into a triangle between the transverse vaults, the thrust being still further opposed by the joists of the lead flat over the aisles.

After Wren had finished his London churches, an Act was passed in 1708 for building fifty new additional parish churches in London and Westminster, and he was appointed as one of the Commissioners for carrying out the Act. He accordingly wrote a lengthy report for the guidance of the various bodies who had in hand the erection of these churches, embodying the experience and wisdom he had collected in the building of his own churches. Among other things, he recommends that churches should be built in the wealthiest parts of the town, so as to be sure of resources for repairs and maintenance at all times, although the first cost would be greater than when building in the suburbs. Church-yards, he insisted, should always be placed outside the town, for manifold reasons. He considers that in ordinary churches there should not be more than fifty feet of space in front of the preacher, thirty feet each side and twenty feet behind, as he considers that a moderate voice cannot be heard well beyond these distances.

Besides his churches, Wren did a good deal of other work in and about London. The Monument, built 1671–1677, to commemorate the Great Fire, is a work of his much abused, but still not so bad as it might have been, for the first design showed it with an ornament of sculptured flames coming out of the windows. In 1668 he built the new Custom-House, subsequently pulled down and rebuilt by Smirke.

The entrance to the Middle Temple from Fleet Street is a nice piece of Wren's work in brick and stone, bold and refined, and of good proportions.

At Greenwich, as is well known, Wren built one of his most important works, the Hospital for Seamen, commenced in 1699. The site had been originally appropriated by Charles II for a royal palace, and the building was commenced by him. Inigo Jones had also built a house for the Queen Henrietta Maria on part of the site; and Queen Mary, when she took up the scheme for building the hospital at Wren's suggestion, insisted on retaining these two buildings as part of the new scheme, as well as on carrying out the four pavilions suggested by Inigo Jones, so Wren made his arrangements to fall in with these requirements, and I think it will be considered that he achieved an undoubted success. It should be stated, that, although Wren originated and carried through the idea of this hospital, he received no pecuniary reward whatever for his services in connection with the building. His work, although strenuous and constant, was entirely gratuitous.

The Greenwich Observatory had been built before this time — in 1675. The correct position for the building, as well as the design and carrying out of it, was settled by Wren, whose skill in astronomical matters was considered as great as that of any of his contemporaries. The Chelsea Hospital is a less important work than its fellow at Greenwich, but still possessing qualities that many buildings of a more ambitious character would do well to emulate.

But perhaps the most successful of all Wren's buildings of a semi-domestic character is the addition to the palace of Hampton Court that he carried out for William and Mary. He has contrived to combine in a wonderful manner the dignity and stateliness that undoubtedly should be the prominent characteristics of such a building with a cheerful and homelike character seldom even attempted by

the builders of palaces, and very rarely attained to by them. This work was begun in 1690, and finished in 1694.

An important early work by Wren is the Sheldonian Theatre at Oxford, the roof of which—a flat ceiling carried over a clear span of seventy feet by principals of very low pitch — is an equally daring and successful piece of carpentry. The tie-beams are jointed up in six or seven pieces.

The influence of Wren's work on the architecture and architects of the succeeding generation was, of course, very considerable. The foremost and most able of his successors, James Gibbs, was a pupil of Wren, and intimately associated with him in some of his important works. Vanbrugh, another man of great power, was Wren's pupil, and acted as clerk-of-works to him at Greenwich. Another, Nicholas Hawksmoor, carried out many of the churches under Queen Anne's Act. His work was less beautiful than that of Gibbs, but decidedly original and characteristic. Several other men, such as Strong—Wren's head-mason at St. Paul's, and afterwards an architect of no little ability—received their training under Wren's guidance. His association with Cibber and Grinling Gibbons, the sculptors employed on most of his principal buillings, is too well known to need comment. A well known and beautiful work by the latter is the pedestal of the statue of King Charles at Charing Cross.

Many important buildings—such, for instance, as the Royal Palace at Winchester—received their direction at Wren's hands, but it would take too long, in a paper of this kind, to enter into a dissertation on their character and merits. They are mostly well known, and generally associated with the name of their author.

It seems almost incredible that a man of such wide tastes and of such minute study in the direction of each bent of his mind could have achieved so much and such successful work in the one special art that he practised; but it has to be remembered that he enjoyed a length of life that has been rivalled among artists only by such men as Michael Angelo and Turner. He died in 1723, in his ninety-first year, having retired from public service only four years previously.

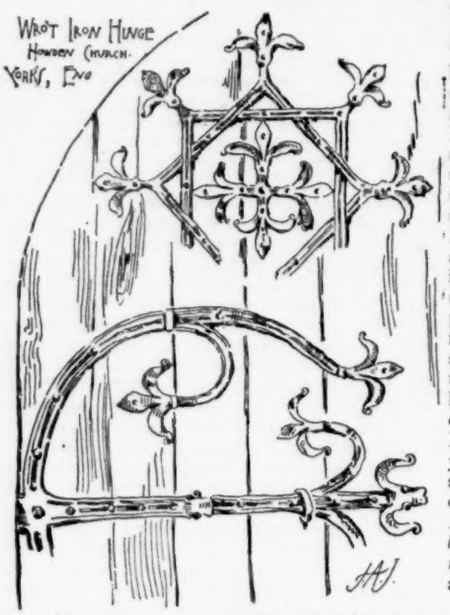
He was elected as a representative in Parliament two or three times, but only sat in one Parliament, his seat on the other occasions being lost on appeal. He received the honor of knighthood in the year 1673.

A life work such as Wren's could never have been carried out had not circumstances been fully ripe for the support of a great architect's career when he appeared on the scene. As James Elmes says in his "*Memoirs*," "When monarchs like Charles and James patronize architecture as they did; when statesmen like Buckingham, Richelieu and Colbert, and magnates like Pembroke and Bedford, encourage it from conviction of its importance; when legislators like Bacon, ambassadors like Wooton, and architects like Jones study, practise and write upon it and its principles, the art is ennobled and ennobles, and *must* flourish. Jones and Wren, two of the greatest names in our history, *loved* architecture *as an art*, *practised* it as a *profession*, but *despised* it as a *trade*." And when we think of the opportunities that Wren enjoyed—opportunities perhaps never before given to a single man—on the one hand, by the total destruction of the city he lived in by fire, and, on the other hand, by the innate love of magnificence and art which distinguished his royal patrons, coming immediately upon the excellent training which he had had to take a leading place in the affairs of his time, it is hardly surprising that he succeeded so steadily in almost every effort he applied himself to, and attained to the high position he occupies in the respect of his own and all succeeding generations.

The inscription placed on Wren's tomb in the Cathedral by his son, whereof the following is a translation, is very apt and appropriate: —"Beneath is laid the Builder of this Church and City, Christopher Wren, who lived for more than ninety years, not for himself, but for the good of the State. Reader, if thou askest for a monument, look around thee."

The Pope's Attitude toward Cremation.—The Vatican has taken a singular step with reference to the cremation question. It has all along viewed with disfavor a form of sepulture which is at least chronologically pagan. But though cremation made its great start in Italy, its progress there has been comparatively slow. Milan remains the headquarters of a system not yet introduced into Rome, and even in Milan, though the mortality keeps its full average, the furnaces are but seldom kindled. The Italians, as a people, are slow to take up "fads," and are accustomed to find the State interest itself in ventures which in other countries are left to private speculation. The new decrees dealing with the question are very wide in their application and very peremptory in their terms. All faithful Catholics are forbidden to affiliate themselves with any cremation society, and no one is to be permitted to order or facilitate cremation, even when the testator should have directed this kind of sepulture for himself, and his executors and next of kin are desirous to carry out his wishes. Of course these decrees do not override the law of the land, though they accentuate the distinction between the Pope's authority and that of the Italian Legislature. In Germany they will probably have no influence at all, and, presumably, not very much across the Atlantic, but in France and Italy the cause of cremation may receive a temporary check.—*Pall Mall Gazette.*

THE NEW YORK CITY LUMBER INSPECTION.



Recent persistent and virulent attacks on the inspection of lumber in the New York City markets have attracted wide attention. To meet these attacks Mr. P. Moore, an experienced inspector of that city, has prepared the following synopsis of the inspection rules that have been in operation in New York for years. As presented in the columns of *The New York Lumber Trade Journal*, the rules are as follows:

Black Walnut. — Black walnut is generally inspected in three grades, viz., firsts, seconds, and culls. In some cases, more particularly in low grade lumber, it is inspected into five grades, viz., firsts, seconds, rejects, culls and mill culls. *Firsts* must be 8 inches and over in width, and 10 feet and up in length. Eight to 11 inches must be clear and free from all defects. Twelve to 18 inches will admit of a slight defect. It may show sap on one side, or on one or both edges, not to exceed 2 inches, or one standard not to show on one side. Eighteen inches and over will admit sap on one or both edges, not to exceed 3 inches, or two standard knots to show only on one side, or one standard knot to show on both sides, or 12 inches and over will admit a split of 18 inches. More than one of these defects will reduce it to a second. Eight feet long, to be admitted in the first grade, must be 12 inches and over in width and free from all defects. Uneven, badly-sawed, and scant thickness will not be admitted, but will fall to the next grade, unless the thickness varies considerably, say ¼ of an inch or more, when it should be classed as a cull. *Seconds* must be 6 inches and over in width and 8 feet and up in length. Six to 8 inches wide, must have a clear face and not show more than one-half sap on other side, or may have two knots to show on one side. Nine to 12 inches wide will admit three standard knots, or 4 inches of sap to show only on one side, may be on one or both edges, not to exceed 4 inches, or in that proportion. Defects may increase in proportion to the width of the board or plank. In boards or planks of good widths the defects may be one large rotten knot, or may have a bunch of worm-holes when otherwise free from defects. This must be left to the judgment of the inspector, as the location of such defects would be very material. *Culls* include all lumber not up to the standard of seconds. All heart, wormy, shaky and miscut lumber should be classed as culls, except such as do not contain one-half sound, merchantable stock, which would be classed as mill culls. *Rejects* are line boards or plank on seconds and culls, and narrow sap culls, showing black face, also boards or plank of good widths, with a sound, straight heart, when otherwise free from defects.

Butternut, sycamore and sweet gum are inspected the same as walnut.

Joists. — Walnut joists running from 3 inches by 3 inches to 10 inches by 10 inches are inspected in three grades, viz., firsts, seconds, and culls. *Firsts* must be ten feet and up in length, sound and free from all defects, sawed square and full size. *Seconds* must be free from all heart shakes, checks and splits. Joists of 10 and 12 feet will admit two standard knots. Fourteen and 16 feet will admit four standard knots, or may show 2 inches of sap on two corners if otherwise free from defects. Defects may be in proportion to the above, which are based on the size of 6 inches by 6 inches. *Culls* include all stock not up to the standard of seconds, including all heart, very sappy, or badly checked stock, except such as are all heart or rotten, which would be worthless. Cherry joists are inspected the same as walnut, except for gum. Slight gum specks will be admitted in the first and second grades. Very gummy joists should be classed as culls. Ash and maple joists are inspected the same as walnut, except that sap, when sound and bright, is not considered a defect.

Cherry.— Cherry is generally inspected in three grades, viz., firsts, seconds, and culls. In some cases, more particularly in low grade lumber, it is inspected in five grades, viz., firsts, seconds, rejects, culls and mill culls. *Firsts* must be eight inches and over in width and 10 feet up in length. Eight to 11 inches must be free from defects. Twelve to 18 inches will admit a slight defect. It may show sap on one or both edges not to exceed two inches, or one standard knot to show only on one side. Eighteen inches and over will admit 4 inches

of sap, or two standard knots, to show on one side, or one standard knot, to show on both sides. Twelve inches and over will admit a split of 18 inches. When more than one of these defects is found it will reduce it to a second. When free from other defects, sound, slight gum specks will be admitted. Eight feet long to be admitted must be 12 inches and up in width and free from all defects. Scant thickness or badly-sawed lumber will not be admitted in this grade. *Seconds* must be 6 inches and over in width and 8 feet and up in length. Six to 8 inches must show clear face, and not more than one-third sap on other side, or may have two standard knots. Eight to 12 inches will admit three standard knots, or will admit sap to show only on one side, may be on one or both edges, not to exceed 4 inches. Defects may increase in proportion to the width. Gummy lumber will be admitted, when not too bad; this must be a matter left entirely to the judgment of the inspector, as to the amount of waste, etc. A board or plank of good width may have one large defect, such as a rotten spot or bunch of worm holes, or similar defects, which would be classed owing to the location and the amount of waste caused by such defects. *Culls* include all stock not up to the standard of seconds, and all heart, wormy, and very gummy boards, or plank, except such as do not contain one-half of sound, merchantable stock, which would be classed as mill culls. *Rejects* are liner boards, or plank, or seconds, and culls, and narrow sap culls, showing one good side, also boards, or plank, of good widths, with a sound, straight heart, when otherwise free from defects. *Strips* consist of 1 inch and 1¼ inches, clear, and clear face, running from 4 to 6 and 7 inches.

Ash.— Ash is inspected in three grades, viz., firsts, seconds, and culls. *Firsts* must be 8 inches and over in width, and 10 feet and up in length. Must be free from defects to 12 inches. Twelve to 18 inches will admit one standard knot, to show only on one side. Eighteen inches and over will admit two standard knots to show only on one side, or 12 inches and over will admit a split of 18 inches in one end if otherwise free from defects. Sap is not considered a defect when sound and free from discolor. *Seconds* must be 6 inches and over in width. Six to 8 inches must be free from defects. Eight to 12 inches will admit two standard knots. Twelve to 16 inches will admit three standard knots or defects in proportion. Sixteen inches and over will admit four standard knots. Heart or dozy boards or plank will not be admitted in this grade. *Culls* include all stock not up to the standard of seconds, including all heart, dote, dead doty, or stained stock, except such as do not contain one-half sound, merchantable stock, which should be classed as mill culls.

Elm is inspected the same as ash.

Oak.— Oak is inspected into three grades, viz., firsts, seconds, and culls. *Firsts* must be eight inches and over in width and 10 feet and up in length. Eight to 12 inches must be clear. Wide boards or plank will admit a split of 18 inches on one end, or two standard knots to show only on one side, when free from other defects. Slight surface checks will be admitted in thick plank. Wormy or stained stock will not be admitted in this grade. *Seconds* must be 6 inches and over in width and ten feet and up in length. Six to 8 inches must show one good side. Eight to 12 inches will admit three standard knots. Wide boards or plank will admit proportionate defects. Stock damaged by heating, or wormy, will not be admitted in this grade. *Culls* include all stock not up to the standard of seconds, including all heart, wormy and badly checked stock, except such as do not contain one-half sound, merchantable stock, which should be classed as mill culls.

Quartered Oak.— Quartered oak is inspected in three grades, viz., firsts, seconds, and culls. *Firsts* must be 6 inches and over in width and 10 feet and up in length. Must be free from all defects to 9 inches. Ten to 12 inches will admit one standard knot to show only on one side, or proportionate defects in wider stock. *Seconds* must be 4 inches and over in width and 10 feet and up in length. Four and 5 inches must be free from defects. Six to 9 inches will admit two standard knots. Wide boards or plank will admit proportionate defects. In boards or plank of good width the defects may be one large rotten knot, or may have a bunch of worm holes, when otherwise free from defects. *Culls* include all stock not up to the standard of seconds, all heart, wormy, stained, damaged by heating, or otherwise defective, except such as do not contain one-half sound, merchantable stock, which should be classed as mill culls. *Narrows*, 1 inch and 1¼ inches, are clear strips running from 3 to 6 inches in width. Must be 10 feet and up in length.

Hickory is inspected the same as oak.

Whitewood.— Whitewood is generally inspected in three grades, viz., firsts, seconds, and culls, and also a grade termed common. *Firsts* must be 10 inches and over in width and 10 feet and up in length, and must be clear and sound to 12 inches. Twelve to 15 inches will admit one inch of bright sap. Sixteen inches will admit 2 inches of bright sap, to show only on one side. Eighteen inches and over will admit three inches of bright sap, or one standard knot to show on one side. Twelve inches and over will admit a split of 1 foot, in lumber 12 feet long; 14 and 16 feet will admit a split of 18 inches in one end. When more than one of these defects is found, it will reduce it to a second. Scant thickness or unevenly-sawed lumber will not be admitted in this grade. *Seconds* must be 6 inches and over in width and 10 feet and up in length. Six to 8 inches must be free from defects. Eight to 12 inches will admit 4 inches of sap to show only on one side, or two standard knots. Over 12 inches will admit one-third sap to show on one side. When free from other defects will admit three standard knots. Defects may increase in proportion to width. Stock stained or damaged by heating will not be admitted in this grade. *Culls* include all lumber not up to the standard of seconds, including all heart or otherwise defective, except such as do not contain one-half sound, merchantable stock, which should be classed as mill culls. *Common* are liner boards or plank or seconds, culls, and bright sap culls, wide sound heart boards, or plank, or large cutting-up boards or plank, when otherwise good.

Joists.— Joists, running from 4 x 4 to 12 x 12, are inspected in three grades, viz., firsts, seconds, and culls. *Firsts* must be 10 feet and up in length, sound and free from all defects, sawed square, and full size. *Seconds* must be sound, free from heart, shakes and checks. Ten to 12 feet will admit two standard knots, or may show 2 inches of sap on two corners. Fourteen and 16 feet will admit four standard knots. These defects are based on size 6 x 6. Other sizes may be admitted with proportionate defects. *Culls* include all not up to the standard of seconds, including heart, very sappy, badly-stained, or checked stock, except such as are all heart or rotten, which would be worthless.

Cottonwood.— Cottonwood is inspected in three grades, viz., firsts, seconds, and culls. *Firsts* must be 8 inches and over in width and 10 to 16 feet in length, clear and free from defects to 12 inches. Twelve to 18 inches will admit bright sap on one or both edges, not to exceed 2 inches, and to show only on one side, or one standard knot to show on one side. Eighteen inches and over will admit two standard knots, or bright sap on one or both edges not to exceed 3 inches, to show only on one side, or will admit a split of 18 inches. When more than one of these defects is found it will reduce it to a second. *Seconds* must be 6 inches and over in width and 10 feet and up in length. Six and 7 inches must be clear. Eight to 11 inches will admit two standard knots, or sap to show on one or both edges not to exceed 4 inches. Defects may increase in proportion to width. *Culls* include all lumber not up to the standard of seconds, including heart, shaky and stained stock, except such as do not contain one-half of sound, merchantable stock, which should be classed as mill culls.

Basswood is inspected the same as cottonwood.

Maple.— Maple is inspected in three grades, viz., firsts, seconds, and culls. *Firsts* must be 8 inches and over in width and 12 feet and up in length. Must be clear and free from defects to 12 inches. Twelve inches and over will admit one standard knot, to show only on one side, or a split of 18 inches, when free from other defects. Sap is not considered a defect, when sound and bright. *Seconds* must be 6 inches and over in width and 10 feet and up in length. Up to 10 inches will admit two standard knots. Wider stock will admit proportionate defects. Stock damaged by heat or stain will not be admitted in this grade. *Culls* include all stock not up to the standard of seconds, including all heart, dry-rot, shaky and badly-checked stock, except such as do not contain one-half sound, merchantable stock, which should be classed as mill culls.

Birch and beech are inspected the same as maple.

Chestnut.— Chestnut is inspected in three grades, viz., firsts, seconds, and culls. *Firsts* must be 8 inches and over in width and 10 feet and up in length. Eight to 12 inches must be free from defects. Twelve to 18 inches will admit one standard knot to show only on one side. Eighteen inches and over will admit two standard knots to show only on one side. Twelve inches and over will admit of a split of 18 inches. *Seconds* must be 6 inches and over in width and 10 feet and up in length. Eight to 12 inches will admit three standard knots. Twelve inches and over will admit four standard knots. A board or plank of good width may have one large defect, such as a rotten spot, a bunch of worm holes, or similar defects, which would be classed owing to the location and the amount of waste caused by such defects. *Culls* include all lumber not up to the standard of seconds, except such as do not contain one-half of sound, merchantable stock, which would be classed as mill culls.

Scant or Tapering Lumber.— In measuring 1¼ inch, 1½ inch, 2 inch and 2½ inch lumber, when more than $\frac{1}{16}$ of an inch scant, it should be reduced in measurement to next thickness. Thick plank ⅛ of an inch scant should be measured full. But a large proportion of lumber $\frac{1}{16}$ of an inch scant, or plank ⅛ of an inch scant, would not be merchantable lumber, and would be subject to deduction in measurement, or otherwise. Tapering lumber should be measured one-third distance from the narrow end. The above rule can vary in regard to lengths or widths, or subject to any mutual agreement; and when such exceptions are made, it should be so described on the inspection returns. In reference to contracts as to specific widths or lengths, the inspection would be subject to such agreement or contract.

Notes.— Dimension stock sawed to order, any given length, or fractional foot thereof, or any size, or fractional inches in size, should be measured actual contents. All wavy stock would be subject to a liberal allowance in measurement. A large quantity of lumber, running largely wavy edge, would not be generally considered merchantable, except such as second growth stock, or stock sawed for a special purpose. A standard knot is considered 1¼ inches in diameter, and sound when the full limits are found. If less knots, greater allowances will be made as to their character. Standard thicknesses are ⅜ inch, 1 inch, 1¼ inch, 1½ inch, 2 inch, 2½ inch, 3 inch, 4 inch, 5 inch and 6 inch. Standard lengths are 12, 14 and 16 feet, also 10 feet are generally so considered. In cherry and walnuts, 8-foot lengths are also recognized.

COMPARATIVE VALUE OF DIFFERENT KINDS OF WOOD AND COAL FOR FUEL.

A late issue of the *Locomotive* gives the following table showing the weight of one cord of various kinds of wood, dry, and their relative values for fuel, red oak being taken as the standard:

Kind of wood.	Weight of one cord in lbs.	Relative value for fuel.
Red oak	3,254	1.00
Shell-bark hickory	4,469	1.45
Chestnut white oak	3,955	1.25
White oak	3,821	1.17
White ash	3,450	1.12
White beech	3,236	0.94
Black walnut	3,044	0.94
Black birch	3,115	0.91
Yellow oak	2,919	0.87
Hard maple	2,878	0.87
White elm	2,592	0.84
Large magnolia	2,704	0.81
Soft maple	2,668	0.78
Soft yellow pine	2,463	0.78
Sycamore	2,391	0.75
Chestnut	2,333	0.75
White birch	2,369	0.70
Jersey pine	2,137	0.70
Pitch pine	1,904	0.62
White pine	1,868	0.61

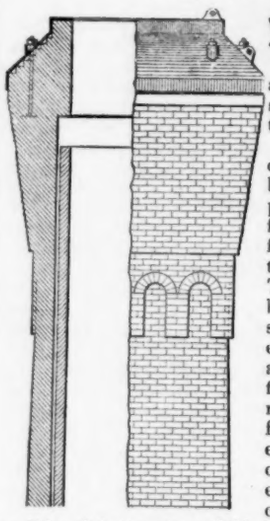
The values given above are from Knapp's "*Chemical Technology*."

The following table, useful in connection with the preceding one, is reproduced from the *Locomotive* of May, 1883. It shows the value of different coals for fuel purposes, the comparison being made with oak wood as the standard:

	Designation of coal.	Mine, where located.	Percentage of combustible in coal.	Lbs. water evaporated per lb. of coal from atmos. press. and 212°.	Equivalent in lbs. of coal per cord of standard oak.
1	Semi-bituminous, Standard Coal Co.	Brothers Valley, Somerset Co., Pa.	88.99	9.85	1,521
2	Semi-bituminous, Philson Iron Coal Co.	Berlin, Somerset Co., Pa.	90.92	9.75	1,537
3	Forest Improvement anthracite	Richardson colliery, Schuylkill Co., Pa.	79.43	9.37	1,598
4	Wilkesbarre anthracite	Black Diamond, Northumberland Co., Pa.	80.77	9.37	1,598
5	Scranton anthracite, D. & H. Canal Co.	Luzerne Co., Pa.	77.3	9.28	1,614
6	Lykens Valley anthracite	Dauphin Co., Pa.	83.97	9.07	1,651
7	Bit. coal, Simpson, Horner & Sons	Monongahela River, Pa.	92.15	9.07	1,653
8	Los Cerrillos anthracite	Ortez grant, New Mexico	88.25	9.04	1,657
9	Scranton anthrac., D., L. & W. R. R. Co.	Luzerne Co., Pa.	82.85	8.87	1,687
10	Bituminous coal, T. Fawcett & Sons	Near Pittsburgh, Pa.	94.04	8.78	1,706
11	Los Cerrillos bituminous	Ortez grant, New Mexico	86.74	8.60	1,742
12	West Virginia splint	Paint Creek, West Virginia	91.90	8.34	1,796
13	Free-burning medium hard	Raven Run mine	94.20	8.24	1,818
14	McAllister coal	Tobooky Co., Choctaw Nation, Ind. Ter.	94.20	7.68	1,950
15	Scotch splint (Duke of Hamilton)	Glasgow	93.28	7.61	1,970
16	Davison, West Hartley	West Hartley district	94.01	7.60	1,971
17	South Wellington coal	S. Wellington col'y, Departure Bay, V. I.	91.83	7.59	1,974
18	Cowpen, West Hartley	Cowpen colliery, Newcastle-upon-Tyne	93.80	7.52	1,993
19	Bituminous coal, Mitchell & Co.	La Plata mine, near Fort Lewis, Col.	89.10	7.49	2,000
20	Indiana cannel coal	Daviess Co., Ind.	75.18	7.32	2,049
21	Nanaimo coal	Chase River, Nanaimo, Vancouv. Island	86.76	7.30	2,079
22	Cowpen Cambois, West Hartley	West Hartley district	93.79	7.04	2,129
23	Wellington coal	Wellington mine, Departure Bay, V. I.	90.62	6.71	2,253
24	Bituminous Leavenworth coal	Leavenworth Coal shaft, Leaven., Kas.	88.91	6.49	2,307
25	Bituminous cation coal	Coal Creek colliery, Fremont Co., Col.	90.	6.45	2,323
26	Bituminous coal	Chestnut mine, Rock Creek Canon, Mon.	67.57	6.07	2,466
27	Rocky Mountain coal	Rock Spring mine, Nebraska	93.59	6.01	2,491
28	Eastport, Coos Bay coal	Mine at the head of Coos Bay, Oregon	91.16	5.24	2,859
29	Pittsburgh coal	Pittsburgh Mount Diable mine, Somersville, Contra Costa Co., Cal.	89.	5.05	2,935
30	Weber coal	Chalk Creek, Summit Co., Utah	89.98	4.73	2,168
31	Lignite coal	Military Reservation, Ft. Stevenson, Dak.	93.77	4.03	3,712

The two tables enable a comparison of the comparative values of any wood and coal to be made. The latter table is from a report on fuel for the army, by Quartermaster-General M. C. Meigs. The value of wood as a fuel depends greatly on its dryness. After two years of natural seasoning it may contain from twenty to thirty per cent of water, the amount of seasoning depending greatly on the condition of the wood, whether sawed, split, or left in its natural state. The calorific power for equal weights of all woods is substantially the same, being about seventy-two hundred thermal units for one pound of dry wood, and sixty-four hundred units when it contains twenty per cent of water.

CHIMNEY CONSTRUCTION.



The *Locomotive*, which in nearly every issue supplies sermons of the utmost value to steam-users and boiler-owners, in a recent number speaks as follows of chimney construction:

The important part fulfilled by a chimney renders it especially desirable that it should be of ample size, well proportioned and properly built. The function of a chimney is primarily to furnish a sufficient supply of oxygen to the fuel to effect its combustion. The first point to be considered is stability. This is sometimes a matter of some difficulty, but if proper care is exercised the condition may always be attained. A good foundation is the first requisite. Most failures of chimneys have occurred through insecure foundations, which have settled unequally. Where practicable, the load on a chimney foundation should not exceed two tons per square foot in compact sand, gravel or loam. Where a solid-rock bottom is available for foundation, the load may be greatly increased. If the rock is sloping, all unsound portions should be removed, and the face dressed to a series of horizontal steps, so that there shall be no tendency to slide after the structure is finished.

One very strong reason for making a chimney foundation as broad as possible is the fact that in high winds the pressure on the foundation may be largely concentrated on the leeward side of the shaft, so that in some localities where the prevailing winds are quite strong their effect alone may be sufficient to cause unequal settling, unless precautions are taken that the foundation is amply large. But in ordinary cases, with short stacks, no trouble need be experienced, for if the base of the foundation be only slightly larger than the shaft, it

Fig. 3.

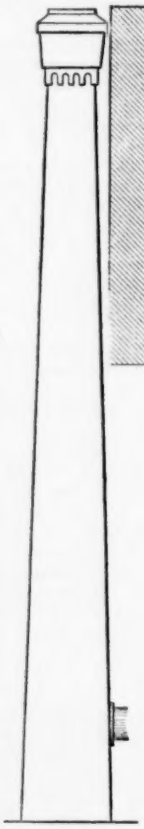


Fig. 2.

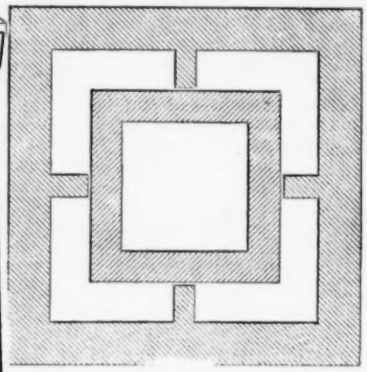


Fig. 4.

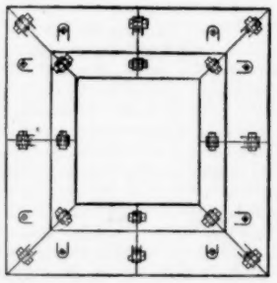


Fig. 5.

will be sufficiently firm. In the case of large chimneys, however, too great caution cannot be observed. Careful calculations should be made, and the design of the stack so modified, if necessary, that all doubt regarding stability may be removed. All boiler-chimneys of any considerable size should consist of an outer stack of sufficient strength to give stability to the structure, and an inner stack or core independent of the outer one. This core is by many engineers extended

up to a height of fifty or sixty feet from the base of the chimney, but the better practice is to run it up the whole height of the chimney; it may be stopped off, say, a couple of feet below the top, as shown in initial cut, and the outer shell contracted to the area of the core, as shown in the engravings; but the better way is to run it up to about eight or twelve inches of the top, and not contract the outer shell. But under no circumstances should the core at its upper end be built into or connected with the outer stack. This has been done in several instances by bricklayers, and the result has been the expansion of the inner core, which lifted the top of the outer stack squarely up and cracked the brickwork.

In the accompanying engravings Figure 2 shows an external and Figure 3 a sectional elevation of a chimney such as we would recommend for small batteries of boilers, where the height of the chimney does not exceed one hundred feet. For a height of one hundred feet we would make the outer shell in three steps — the first, twenty feet high, sixteen inches thick; the second, thirty feet high, twelve inches thick; the third, fifty feet high and eight inches thick. These are the minimum thicknesses admissible for chimneys of this height, and the batter should be not less than one in thirty-six to give stability. The core should also be built in three steps, each of which may be about one-third the height of the chimney —the lowest, twelve inches; the middle, eight inches, and the upper step, four inches thick. This will insure a good, sound core.

The Initial cut shows a plain, simple finish for a chimney-top, but one which looks neat if it is well proportioned. Care should be taken, however, that it is not made too short in proportion to the length of the shaft, or it will look "squat." The finish of a chimney should be such that it harmonizes with the style of the surrounding buildings. It costs no more thus, and looks vastly better. The top of a chimney may be protected by a cast-iron cap, Figure 5, or perhaps a cheaper and equally good plan is to lay the ornamental part in some good cement, and plaster the top with the same material.

COMMUNICATIONS

[*We cannot pay attention to the demands of correspondents who forget to give their names and addresses as guaranty of good faith.*]

BOOKS.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,— Please give me, through your journal, the names of some of the standard books on Romanesque architecture in general, and also the best books on Norman architecture, and illustrated books on Byzantine ornamentation.

Yours very respectfully, J. G. BRAECKLEIN.

[(1.) Revoil's "*Architecture Romane du Midi de la France.*" (2.) Cotman's "*Antiquities of Normandy,*" Pugin's "*Specimens of Anglo-Norman Architecture.*" (3.) Verneilh's "*L'Architecture Byzantine en France.*" Heideloff and Görgel's "*Les Ornaments du Moyen Age.*" —EDS. AMERICAN ARCHITECT.]

THE TERRACE OF THE CAPITOL.

BROOKLINE, August 9, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,— Your comments of the 7th inst., on the plan of this structure may make the following notes desirable:

1. The plan of the building makes a raised open walk adjoining three sides of it (which is a "terrace") indispensable, as a means of access to and of communication between several entrances. The grounds of the Capitol could not be laid out fittingly, except with carefully studied relation to a structure for this purpose. Hence the landscape architect was compelled to present a plan for it in connection with the plan for the grounds. "The flights of steps, parapets, balustrades, etc.," to which you refer as ornaments, are necessities of convenient use, and in no way more decorative than is required for unity of composition with the main structure. There is believed to be not a particle of "sham" in all of the terrace.

As to a possible difference of judgment growing out of the difference of habits of architects and landscape architects it is to be observed:

2. All the drawings before Congress illustrative of the plan of the terrace have been prepared in the offices of well-known architects, and bear their office stamps.

3. Before the plan was presented to Congress it was reviewed and approved by the architect of the Capitol.

4. Before it was adopted the plan was submitted for criticism to the architect of the Treasury and to the president of the American Institute of Architects, and was formally and unqualifiedly approved by each of them.

5. The landscape architect of the work entirely agrees with you that "for landscape gardening purposes" simple retaining-walls would be sufficient. He has from the first expressed this opinion. It was not from æsthetic reasons, therefore, as you pleasantly suggest, but from regard to utilitarian needs that the terrace is not to be a solid structure. A vain effort was, in fact, made to obtain the assent of Congress to such a mode of construction for a large part of the work. Yours respectfully, O.

[WE regret that Mr. Olmsted has not said something as to the feasibility of lighting some of the rooms from the outside, which is the only point at issue between him and Congress. For our own part we have expressed ourselves qualifiedly in favor of windows only on the supposition that the working convenience of Congress will be interfered with by reason of their absence. If the real economical and practical value of the new rooms is their capacity as storage rooms for rarely visited archives, the matter of external light is of no consequence, and the designing of the terraces architectually correct. As to the external architectural effect of the new work on the composition of the Capitol itself we have no more reason now than last week for supposing that it is not very nearly what it should be. — EDS. AMERICAN ARCHITECT.]

BRICK WALLS.

BALTIMORE, MD.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,— Will you be kind enough to tell me how to find the carrying capacity of brick walls? I am about to build a large warehouse, in which heavy weights and running machinery will be placed. I have looked through all the text-books I could find but do not find what I want. None of them seem to take the height or width of wall or pier into account. I should think that the height should be taken into account, if not the width. In case of using piers along the wall, would the part of the wall between piers be taken into account or not? If so, what proportion of strength would they add to pier? These piers support cross-girders. The stories are low, averaging 12′. By answering by mail as soon as possible, you will greatly oblige,

Yours respectfully, A. H. BIELER.

[FINDING the same difficulty that our correspondent found — a difficulty that one usually experiences, by the way, whenever he seeks in books for a formula or statement which will exactly fit the case in hand—we applied to Mr. Berg for help, thinking that, as his attention is just now turned to such subjects, he might give a much more reliable answer than our own researches could evolve. Mr. Berg says: "Many of our large cities have building laws giving the required strengths of walls. As a rule, these are amply safe, unless the wall is riddled with flues or openings. In the latter case, each separate pier might be calculated as isolated piers by the method I have already given in 'Safe Building,' second article (latter part of article). The part of wall between the piers will add its own weight to that already on the pier, but, on the other hand, shortens the pier and prevents it from giving by buckling *into* the opening. To prevent bulging into the street, I should take the height of each story between girders as the height of the pier, and use formula given in my second article. In substituting the value for ρ^2 use the last column of Table I and Figure 3, viz.: $\rho^2 = \frac{d^2}{12}$. For d use the thickness of pier (wall) in the different stories. If the pier is very narrow (that is, not as wide as it is thick), it should also be figured, using height of opening as the height of pier, and using the width of pier for d (in place of thickness). The load on pier will be, of course, the whole load on pier above, plus one-half the load on girder (if girder is symmetrically loaded, as it probably is), plus one-half of brickwork each side between piers, plus weight of pier itself. This calculation supposes the pier to be well anchored to girder at each story. The amount to be allowed for $\left(\frac{c}{f}\right)$ depends entirely upon the quality of the brickwork. This can be found in column three of Table V of my articles. In regard to solid walls, he had better use the '*New York City Building Law*' as a guide."— EDS. AMERICAN ARCHITECT.]

NOTES AND CLIPPINGS

A LONG PENDULUM.— The longest clock pendulum in the world is at Avignon, France. It is 67 feet long, and requires 4½ seconds to swing through an arc of 9½ feet.—*Exchange.*

EQUESTRIAN STATUE OF FREDERICK WILLIAM IV AT BERLIN.—The unveiling of the equestrian statue of the late King Frederick William IV at noon, June 15, was an impressive State ceremony. The monument represents the late king seated on a powerful horse, with allegorical figures of art, religion, history and philosophy seated at the four corners of the pedestal.— *London Times.*

THE ROYAL TOMB AT MUNICH.— The royal tomb in the cave under the Church of St. Michael, in Munich, in which the mortal remains of King Louis II were deposited, contains at present 23 coffins, including those of two Bavarian princesses—one the daughter of Emperor Charles VII, who died at 18 years, the other a daughter of the Duke Ferdinand Maria, who died at 20 years of age. Thus far the body of the late king is only incased in an oaken coffin, richly and artistically ornamented; in a week or two the wooden receptacle will be inclosed in an elaborately wrought metal one, bearing the name and the crown of the unhappy monarch.— *American Register.*

"TUBERCULOSIS" IN CAST-IRON WATER-PIPES.— M. Lory, Dean of the Faculty of Sciences of Grenoble, applies the term "tuberculization" to a change to which cast-iron pipes are subject when they have to convey certain kinds of potable water, those which are purest according to the hydrometric scale being frequently those which cause the greatest trouble. The interior surfaces of the pipes attacked have upon them tubercles or ferruginous concretions, which gradually diminish the capacity of the pipes, and even in time entirely obstruct them. These concretions (which are formed essentially of hydrated peroxide of iron) are never found to contain traces of salts of lime, and when they are dissolved in dilute hydrochloric acid they leave as a residue from 5 to 15 per cent of vegetable matters, which are easily recognizable with a microscope, and among which a number of diatoms are often to be distinguished. This alteration in the constitution of the pipe is sometimes

noticeable after four months' use, and the operation of tarring is insufficient to arrest it. Experiments made by M. Thierwoz, engineer of the Grenoble Water Works, show that this corrosion of cast-iron is altogether independent of the electric phenomena resulting from the contact of the metal with the lead collars by which the pipes are connected. M. Lory recommends the immersion of cast-iron pipes in spring water for a period ranging from 10 to 12 months before they are laid, to insure them against corrosion. Manchester water has the above effect.—*Iron Age.*

A Nickel Lightning-rod.— Nickel is a metal which has properties similar to iron, but has the great advantage over the latter of not rusting in moist air. Iron is now used to a considerable extent for lightning-rods, but inasmuch as it rusts in the air, nickel is preferable. A rod of nickel has been tried on a building at Dresden, but not for sufficiently long to test its durability. Everything, however, is in favor of the new material, and it will be interesting to hear how it serves, as copper is, apart from its conductivity, not a particularly good material for lightning-rods.—*Engineering.*

Insects as Sanitary Inspectors.— The *Sanitarian* relates a case in which a rat had died under the floor of a large drawing-room and was giving great offence to the owner of the house, who had had the carpets and furniture removed preparatory to taking up the floor. An ingenious friend drops in, suggests that the doors and windows be shut, steps out to the stable and traps a couple of blue-bottle flies, and returning, sets them free in the apartment. The flies, after a little undetermined buzzing, settle pertinaciously on a certain crack in the floor, and on the removal of one plank at this point the cause of offence was readily removed.

Iron in the Confederacy.— "Iron was now the precious metal. War not only monopolized the entire product of the South, but so sore was the need that frequent calls were made for plantation bells to be cast into cannon. Many church bells were also given. In the cry for iron! iron! a large society of ladies undertook to furnish material for building an iron-clad by collecting all the broken pots, pans and kettles in the Confederacy. The home folk had to depend almost entirely on the reworking of old iron. An active and unremitting search was maintained for every superfluous or cast-away scrap. All old vehicles and farm implements, not absolutely indispensable, were demolished, and the iron they contained was diverted to the pressing needs of the moment. All idle nails were carefully drawn and laid away for future use. A sharp lookout was kept for stray pins. Womenkind made their boasts of the weeks and months they passed without missing a single pin; while the loss of a good darning needle would have been a calamity involving perhaps half a neighborhood. The rapidity with which such indestructible articles as pins, needles, buttons, etc., disappeared from the face of the earth after the blockade was established was as unaccountable as the speed with which larger things wore out. Many a hard-beset housewife, in her distress, 'vowed,' and half believed that the Yankee manufacturers, with a prophetic eye to the future, had purposely made the wares sent South of the most worthless description, in order that their collapse might embarrass us in the prosecution of the war."—*August Atlantic.*

Peasant Proprietorship in Norway.— Norway presents us with the grandest picture of the effects of peasant proprietorship. There the land has, from time immemorial, been the property of the laborer who tills it — it has never been poisoned by the foul curse of feudalism. The title-deeds of many of these peasant holdings are in a dead language, and the names of the peasants are those of the district. The results are marvellous. Land which no English farmer would or could cultivate under our agricultural system, even if receiving a liberal bounty per acre instead of paying rent, is there made to support whole families, and that by the same race as ourselves, and in latitudes hundreds of miles farther north than John o' Groat's house, some of it even within the arctic circle. Sailing along the arctic coast of Norway the tourist passes here and there little oases, called "stations," where the steam omnibus halts to land and embark a passenger or two. If a careful observer, he may learn that in the midst of the rocky desolation there is a deposit of rock fragments and gravel left by an ancient glacier in a hollow formerly filled by the ice. This is cultivated, is a dairy-farm and fishing-station, farmers and fishers being all freeholders and capitalists, no such class as laborers without property existing there. One of the grandest of the Norwiegan fjords is the Geiranger. It is walled by perpendicular precipices from 1,000 to 3,000 feet high. Sailing along the fjord a boat-house is seen here and there at the foot of the dark wall. Looking skyward directly above it may be seen what appear to be toy houses on a green patch. Closer observation reveals moving objects, a field-glass shows that they are cattle, goats and children, tethered to boulders to prevent them from straying over the edge of the precipice. A family resides up there, cultivating this bit of ancient glacier ground, backed by craggy mountain tops, with a foreground of precipice above the fjord. The only communication between these eagle-nest farms and the outer world is by the boat below. How that boat is reached, where is the staircase of ledges on the face in the precipice, is incomprehensible to the passing tourist. In most cases no indication of a track is visible. Nothing but absolute proprietorship by the cultivator could bring such land into cultivation. Latitude 62°, altitude 2000 and 3000 feet, summer three to four months long; the ground covered with snow during six to eight months of every year.—*Gentleman's Magazine.*

Southern Pine.—The *Times-Democrat* has called attention more than once to the fact that the Southern yellow pine is rapidly growing into favor in the North and West. The fact is now recognized that it must supply the deficiency in the Western lumber supply, and that it can well do this. Until of recent years such Southern pine as has been shipped North has been sent by way of experiment. Its value for flooring, for railroad cars, etc., was then recognized, and it was imported, although still in limited quantities. But its uses have gradually extended from year to year, and the demand for it increased.

The Chicago *Lumberman* calls attention to the fact that the new elevator at Duluth, Minn., on the shores of Lake Superior, and the most northern point in the State, in the very centre of a heavily-timbered country, is being built of Southern pine from Mississippi and Louisiana. Although the lumber has to be carried by rail 1,200 miles, it is still found the best and cheapest for this purpose. In Chicago, also, the most important lumber market of the world, the largest warehouse yet built there is under construction of Southern pine, it being the strongest and best timber for heavy edifices. These facts bear evidence of the value of this Southern timber. If it can compete with the product of Michigan and Minnesota to-day, while their forests yet remain, what must be its superiority, what its value, when the country will be compelled to depend almost wholly upon the South for its lumber?—*New Orleans Times-Democrat.*

TRADE SURVEYS

Rather contradictory statements are made by architects and builders concerning the reliability of much of the statistical matter compiled on building operations. Second-class reporters are often entrusted with the delicate work of summing-up, from various disconnected sources, the aggregate of work done in many of our large cities. In some, the work is done correctly; in others, not. The general results are on the right side. The impulse given to enterprise has not been exhausted. Already a fresh impulse is gathering in fresh railroad construction. Since June 1, eleven thousand miles of railroad, according to railroad journals, have been projected. Borrowers have been, and now are, negotiating for large loans in financial centres for three thousand miles of road. There is a stronger tendency to borrow money to build railroads now than since 1882. Large blocks of idle capital have been awaiting a reviving confidence. Even before the improving returns fully justify it, capital is manifesting a readiness to again venture in the dangerous fields it retreated from so disastrously. The receivers have not yet completed their railroad-hospital work before new schemes are looming up. If half the money asked for is loaned, a boom of moderate proportions will be precipitated next spring in railroad construction. Several outside mills are now engaged on rolling imported blooms, and three more in Pennsylvania will be at work on rail-blooms in a few days. There are inquiries in manufacturers' and brokers' hands this week for one hundred thousand tons of steel rails. Within the next thirty days the locomotive-builders will have orders for over one hundred additional locomotives, and already the car-builders are refusing orders for delivery inside of ninety days. The textile-manufacturers are piling up orders steadily, and in some quarters an era of slightly higher prices is predicted. Carpet, cloth, hosiery and cotton-goods mills are pretty well crowded. Labor is causing some trouble both North and South. Wages have an upward tendency. Wool is advancing, but during the current week sales have fallen off in consequence. Lumber has sold freely at all Atlantic ports, notwithstanding the chronic depression trade reporters write about. The only just cause of complaint among lumbermen is that they are doing a large business for a small return. The builders of general and special machinery are accumulating orders for the winter. Recent improvements have rendered considerable displacements of older makes and styles necessary, and this helps to explain the general activity among machinists. A score or more of machinery-making firms of national reputation have stated, within a few days, that their prospects have never been as gratifying. Providence, Taunton, Philadelphia, Pittsburgh, Alliance, South Bend, Indianapolis, Moline, Chicago, and more Western machinery centres, are crowded with urgent work. This favorable condition is not temporary. The agents of machinery manufacturers and of machinery supply-houses are quite unanimous in the opinion that the foundations are well laid for an increasing business. The planing-mill and wood-working machinery interests are also oversold, though to a less extent than iron and machinery interests. The builders of the New England States are fairly busy on work of a jobbing or retail character. Building operations in New York City foot up $41,000,000 in value. In Philadelphia the greatest activity prevails. In Pittsburgh new work is coming out. In Chicago a large amount of work is on hand, but comparatively few large business buildings are projected. Small dwellings will be built, as the demand is still urgent. The greatest interest is exhibited in suburban houses. Architects are busy on this class of work. Real estate is active in St. Louis. Architects have excellent prospects, and will have a busy season up to the close of the year. Building activity is more general in smaller towns and cities, where real estate is selling at better prices than last year. The architects are generally pleased with the indications for the season. A fresh impetus may be imparted during the autumn season. The abundance of money is a favorable feature. Banks in the West are well supplied, and are filling all demands for funds. When the withheld enterprise of the first half of the year is freed the low range of prices for raw material will disappear.

The industries are waiting for an excuse to precipitate over-production. The expansion of productive capacity that has been quietly going on for years will produce results of an unfavorable character sooner or later. The evil is not near at hand. Railroad building on an extensive scale next year will carry us a year or two longer. The outflow of population to new States will help to postpone the reaction. Wise legislation will also help to preserve the industrial vigor which has been attained during the past eight years. But there is a tendency beneath and behind all these favorable symptoms to a reaction and depression which we have not, as yet, the wisdom to avoid or the commerical organization to control.

The labor movements of the knights and the trades-unionists are all directed to more perfect organization. In some of the Western States the wage workers are seeking to inaugurate political action. In the Eastern and Middle States opinion is pretty evenly divided. The active workers, taking counsel from experience, are advising against political agitation, and point out that the only true and permanent progress is through education and organization. Strikes are rare. The eastern Pennsylvania iron-workers have been asked to strike, and probably will do so. The glass-workers will resume work September 1-15 on satisfactory schedules. The coal-miners will organize a National District Assembly, and the Knights of Labor will divide the work of adjusting strikes between the States, so that each State organization will be independent.